THE EARTH AND ITS PEOPLES

EUROPE AND INDIA

A Geography Textbook for Middle Schools

PART THREE

NATIONAL COUNCIL OF EDUCATIONAL RESEARCH AND TRAINING

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FOREWORD

This book is one of a series of books on 'The Earth and Its Peoples' prepared by the Department of Social Sciences and Humanities for use in middle schools. The major part of this particular book is concerned with our country, India and deals with the problem in a way that should excite and enthuse our students about their own country.

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Suggestions for the improvement of the book are welcome. They will be gratefully acknowledged and considered while bringing out the next edition.

New Delhi
May 1, 1971

S.V.C. AIYA
Director

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CONTENTS

UNIT ONE

CLIMATE AND THE CHANGING FACE OF THE LAND

Weather, as you know, is the condition of the atmosphere at a given place in regard to its temperature, moisture, winds and the state of sky. Climate on the other hand is the average of the weather conditions of a somewhat large area. The basic elements of weather and climate are the same. They are temperature, moisture, precipitation, sunshine, air pressure and winds.

The climate of a place depends upon its distance from the equator, height above sea level, distance from the sea, ocean currents and direction of winds.

Since weather and climate have great influence on our life we need to know more and more about them. Weather forecast is of great help to us in knowing beforehand the weather conditions of the next 12 to 48 hours. In the following pages you will know how it is done.

You will also find that the atmospheric conditions influence even the landscape, of course, very stealthily and steadily. Natural agents such as running water, moving ice, wind, sea waves and even ground water are constantly busy at razing down to the ground level big relief features like mountains and plateaus. They are busy as it were at levelling high and low relief features bringing them to a common level or a 'grade'. The following pages would disclose to you that even the forces of nature are indeed great 'levellers.'

1

Knowing More About Our Weather (I)

THE TERMS YOU ALREADY KNOW: *Air Temperature*—The degree of heat of air measured with the help of a thermometer. *Precipitation*—'Throwing' down of moisture by the air. It may be in the form of rain, snow, hail or dew.

MAN in his early days was always at the mercy of unpredictable weather. He was never certain when it would become unbearably hot. Nor could he know when it would become too cold. To his surprise, all of a sudden clouds would gather together and it would begin to rain. To his discomfort there would be a flash of lightning followed by a deafening thunder. Gusty winds would uproot huge trees in no time. Sometimes it would pour down and clear up in a short while. At times it would continue to rain for several days almost without a break, causing devastating floods. On the other hand, there may be very long dry spells, bringing in their wake severe famine.

As time went on man was able to notice that there were certain periods when it was generally hot; and others when it was cold. He also noticed that there were certain periods when it would rain frequently. Nevertheless, he was always uncertain about the sudden

changes that took place in weather from day to day. He had to be constantly prepared for any eventuality.

The struggle of man against the odds of weather has been going on even to this date. Even after thousands of years of struggle with nature we are nowhere near the final victory over weather. Nevertheless, we are in a much better position as compared to our great forefathers. Now we know what elements constitute our weather, and we are able to measure each one of them. We are also able to explain various weather phenomena, how and why they occur. As a result we are in a better position to adjust ourselves to the climatic conditions in which we are placed.

TODAY'S WEATHER IN DELHI

TEMPERATURE		RELATIVE	HUMIDITY	RAINFALL	SUN		MOON	
Max.	Min	Max	Min.	(in Cms)	Sets	Rises	Rises	Sets
28·8°C (83 8°F) 1°above nor	5 2°C (41 4°F) 2°below nor	65%	31%	.	5-36 p m (To-day) Lighting Time 6 06 p.m	7-15 a.m (Tomorrow)	11-21 a m	not before midnight

FIG. 1. *Today's Weather in Delhi*

Note the information given about various elements of weather. Can you find out the duration of daytime? See if you can guess the month to which this daily weather report belongs.

You must have seen such a column in several newspapers. If you happen to live in a big town or a city like Delhi, you are in a position to know many a detail of the weather of your place for the previous day. Moreover, it tells you what kind of weather you are likely to have for the day.

Such information is naturally very useful for everyone. If it tells you in the morning that it is likely to rain today, you would

like to take your umbrella with you to school. Now let us see what information is supplied to us through a newspaper about the weather everyday. You would also like to know how this information is collected.

This small column about daily weather gives us information about temperature, humidity and rainfall of the previous day. It also tells us the timings of sunrise and sunset for the day. So it does about the moon. Some papers tell us even the lighting up time, that is the time when street lights need to be lighted up. Above all they tell us whether the coming day is going to be warmer or cooler; whether it would be clear or cloudy; whether it would rain and if there is any likelihood of strong winds or a dust storm or a thunder-storm. All this is collectively known as *weather forecast.*

As regards the temperature of the previous day, two figures are given. The first figure refers to the degree or intensity of heat, when it was the highest during the past 24 hours. This is known as *maximum temperature* for that day. The other figure refers to the degree or intensity of heat, when it was the lowest during the same period. It is known as the *minimum temperature* for that day.

You would find in this column that temperature is expressed in degrees of centigrade. In most of the papers you would also see that it is expressed in degrees of Fahrenheit as well. It means that the temperature is measured in two different scales, namely the centigrade and the Fahrenheit. In both the systems the freezing point of water is the starting point and the boiling point of water is the end point. It is this range of temperature which is divided into a number of equal units. In a centigrade system the freezing point is taken to be O° centigrade, and the boiling point of water is taken as 100° centigrade. On the other hand, in

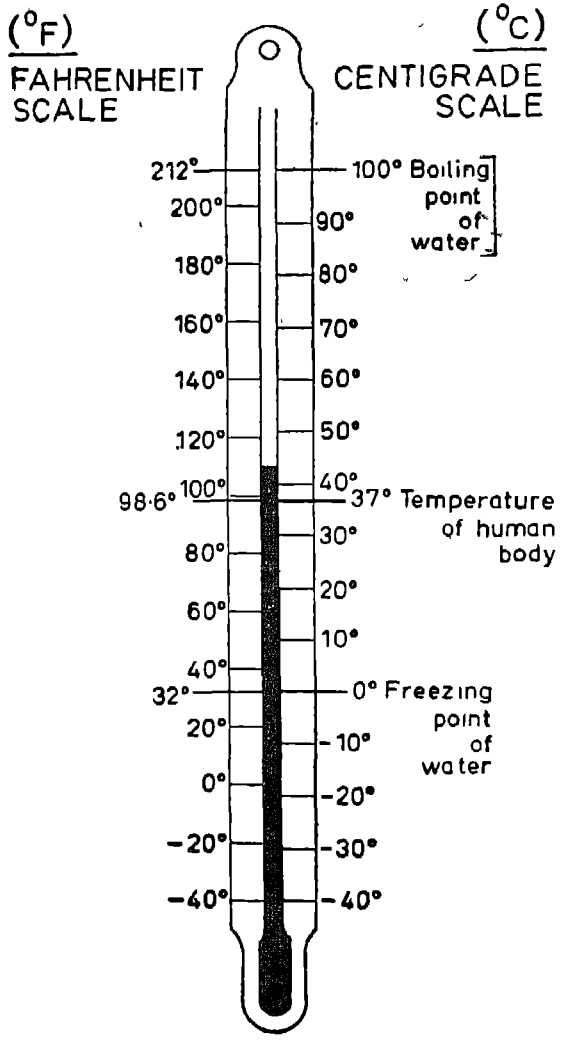


FIG. 2. *Fahrenheit and Centigrade Scales of Thermometer*

You will find from this diagram that 10°C is equal to 50°F of temperature. Verify it with the help of formula given in the text.

the Fahrenheit system, the freezing point of water is taken as 32° Fahrenheit and the boiling point as 212° Fahrenheit. For the sake of convenience centigrade is indicated by its initial letter C and Fahrenheit by F only.

Before 1962, Fahrenheit Scale was in use in our country; but now we use the Centigrade Scale. If you know these two scales for measuring temperature, you can very easily convert the temperature, expressed in one system into another. If you want to convert the degrees of centigrade into Fahrenheit all that you have to do is to multiply the degrees in centigrade by 9/5 and add 32 degrees. If you are to convert Fahrenheit to the centigrade simply deduct 32 from the degrees of Fahrenheit and multiply the remainder by 5/9.

After stating maximum and minimum temperature that was recorded on the previous day, the column further tells us whether each of these two temperatures were below normal or above normal for that day. How do they do it? The weather office which notes daily temperatures keeps a permanent record of these figures. With the help of these figures spread over several years, they have calculated the normal maximum temperature, the normal minimum temperature and the normal mean temperature for every day. Thus the weather office is able to tell us whether the temperatures recorded for the day were just normal, or below or above normal.

Suppose you know the maximum temperatures that were recorded on 12th of June for the last 50 years. Will you be able to calculate the normal maximum temperature for that day? Just write down the maximum temperatures recorded for the fifty years. Add them all and divide them by the total number of years, which is fifty in this case. Similarly, you can also find out the normal mini-

mum temperature for the day. Can you now think and explain how to arrive at mean daily, mean monthly and mean annual temperatures?

An instrument used for measuring temperature is known as thermometer—where the word 'thermos' means heat and 'meter' means measurer. You must have seen a thermometer which is used by doctors or physicians. It is commonly known as a doctor's thermometer or a clinical thermometer. Since this thermometer has a limited purpose of finding out the temperature of our body, it shows temperature only from 95° F to 110° F. Can you convert these figures into centigrade? Find out the normal temperature of a human body in Fahrenheit and then express it in centigrade.

The thermometer used for measuring temperature of air also works on the same principle. You have studied the working and construction of a thermometer in your science lessons. Why is mercury used in these thermometers?

Noting the maximum and the minimum temperature during a period of 24 hours is not an easy job. One would be required to keep a constant vigil all the 24 hours to know when the mercury in the thermometer had shot up to its maximum and had dropped to its minimum. In order to avoid this difficulty there is a special thermometer known as *maximum and minimum thermometer*. Named after its inventor, it is also known as Six's Maximum and Minimum Thermometer. It saves man the trouble of keeping constant watch on the instrument to note the highest and the lowest temperatures during a given period. Do you know that even a doctor's thermometer is in a way a maximum thermometer—that is a thermometer that records only the maximum temperature? How is it so?

For taking the temperature of the air around us it is necessary

that a thermometer is kept in a place having free movement of air. It is also necessary that the thermometer is not exposed to the direct rays of the sun. Moreover, it is kept at a height of about a metre from the ground. Why do you think such precautions are necessary?

Rainfall

In the column of Today's Weather, the actual amount of rainfall is stated for the last 24 hours. Rainfall is measured in millimetres. Suppose it rained 8 millimetres during a day What does it mean? It means if the rain-water was allowed to stand over a given level-area, the depth of the layer of rain-water would be 8 millimetres.

While taking the measurement of the depth of the layer of rain-water we have to take certain precautions. None of it is allowed to run off outside the given area. It is also necessary that none of it is allowed to soak or seep into the land below. Nor should we allow its loss by evaporation into the air. Moreover, it

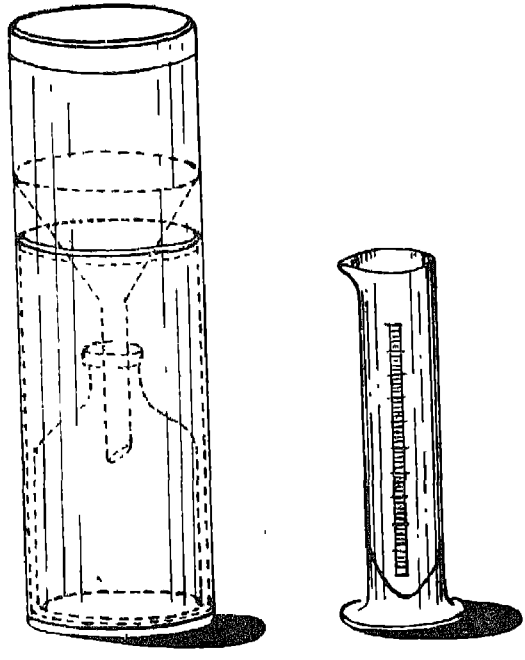


FIG. 3. *A Rain-gauge*
Note the receiving vessel, a highwalled funnel and metal container. Why is the funnel wall so high?

is presumed that the land is uniformly flat. It would appear, therefore, the conditions to be fulfilled are very exacting. Now you would understand how an instrument meant for measuring rainfall fulfills all these conditions.

The instrument used for measuring rainfall is known as a rain-gauge. It consists of a metal cylinder, a vessel and a funnel, besides a measuring glass. You will notice from the picture of a rain-gauge that the circumference of the mouth of the funnel is equal to the base of the receiving vessel. Why is it so? What is the need for having a metal container? What is the necessity of having a high-walled funnel?

A rain-gauge is kept in an open and level area, away from trees and buildings. It is kept generally 30 centimetres above the ground level. Necessary steps are also taken to protect it from stray animals. Can you explain why all these precautions are taken?

Relative Humidity

Sometimes we sweat a lot even when we are just sitting in our room. At times, you must also have noticed that the wet clothes require only a short time to dry up. But sometimes they do not dry up even in 30 or 40 hours. How will you explain these facts? How would you describe such a weather? Adjectives such as humid, moist, muggy or sultry are commonly used to describe such a type of weather.

If a relatively dry air keeps on moving, you do not find sweat collecting on your body. Nor do you feel the air very hot. Why is it so? The temperature of your body is kept low, as a result of evaporation of sweat. On the other hand, if air is calm and is full of water vapour, the evaporation is either stopped or it takes place

extremely slowly. This invisible water vapour present in the atmosphere is known as *humidity*.

How is humidity measured? There are two ways of doing it. The total or absolute humidity of a given unit of air is measured in grammes per cubic metre of air. This measurement is not very useful because the capacity of air to hold moisture changes with a rise or a fall in temperature. The warmer the air, the greater is its capacity to hold moisture.

Another and more useful way of expressing humidity of air is to state the relationship between the actual humidity and the maximum capacity of air to hold moisture at a given temperature. This is how it is expressed in weather bulletins and elsewhere.

The maximum capacity of air to hold moisture is taken to be 100, when it would normally precipitate in any of the forms such as rain, snow, dew or hailstone. When humidity is expressed in relation to this maximum capacity of air to hold moisture at a particular temperature, it is known as *relative humidity*. It is expressed in per cent. Now you would understand what it means when the maximum relative humidity on a given day was 78 per cent and the minimum 35 per cent.

THE NEW TERMS YOU HAVE LEARNT: *Maximum Temperature*—The degree or intensity of heat of air when it happens to be the hottest during a given period. *Minimum Temperature*—The degree or intensity of heat of air when it happens to be the coldest during a given period.

EXERCISES

Review Questions

1. Answer the following questions:
   (i) Name the two scales in which air temperature is expressed.
   (ii) What is daily range of temperature?
   (iii) List major four headings under which the column—"Today's Weather"—provides you information about daily weather.
2. Distinguish between:
   (i) Maximum temperature and minimum temperature of a day
   (ii) Absolute humidity and relative humidity.
3. Complete the following statement with a correct ending:
   We are in a better position to anticipate sudden changes in weather because
   (i) we now control weather.
   (ii) we now know all the secrets of weather.
   (iii) we can now predict weather after interpreting highly accurate weather data
   (iv) we now possess several highly advanced weather instruments
4. What is rainfall? What important considerations and precautions are involved in its accurate measurement?

Map Work

5. Given below are the mean monthly temperatures, in centigrade, of Srinagar for a year. Study them carefully and answer the following questions:

Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec
-1°	1°	7°	13°	18°	21°	23°	22°	18°	12°	7°	2°

   (i) What are the mean minimum and maximum monthly temperatures?
   (ii) What is the annual range of temperature?
   (iii) What is the mean annual temperature?
6. Collect data regarding maximum temperature and minimum temperature for a week form Monday to Sunday from the column of daily weather published in your local newspapers:
   (i) Work out mean temperature for each day.
   (ii) Similarly, find out mean temperature for that week

Topic for Class Discussion

7. *How Air is Polluted By Man*

Find out the different ways in which man pollutes air Discuss how it affects the health of man. Suggest possible precautions that should be taken to avoid pollution of air

2

Knowing More About Our Weather (II)

THE TERMS YOU ALREADY KNOW: *Isobar* —An imaginary line, drawn on a map, which connects places having the same atmospheric pressure at a given time, presuming that all the places are situated at sea level. *Isotherm*—An imaginary line drawn on a map and passing through places having the same temperature for a given period, presuming that all the places are situated at sea level.

So far we have found how the elements of weather like temperature, humidity and precipitation, particularly the rainfall, are measured. There is one more important element of weather, namely pressure which the atmosphere exerts on the earth's surface.

Air Pressure

You know air has weight and it exerts pressure. You also know that the density of air varies from place to place and from time to time. Generally the density of air is highest at sea level and goes on decreasing with increase in altitude. That is, the lower layers of the atmosphere are denser than the upper ones.

There is also a close relationship between temperature, density and pressure of air. The air expands with an increase in tempera-

ture. It means it reduces its density and decreases its pressure.

Owing to marked variations in the temperature of air from place to place, it is but natural that the pressure of air should vary from one place to another.

At sea level the pressure of the atmosphere is 1.03 kilogramme per square centimetre. At this level the entire column of air over a given area is balanced by a column of mercury measuring 76 centimetres in height. Why is mercury considered the best choice for this purpose?

As you go up and up, the height of the air column goes on decreasing. Correspondingly the height of the mercury column balancing the pressure of air also decreases.

You have by now seen that mercury is very useful to us in measuring not only the temperature but also the pressure of air. This is possible because of its two important properties. This liquid metal very readily expands and contracts in sympathy with the changing temperature of air. Secondly, its freezing point is very low and boiling point very high.

Although the height of the column of mercury is the basis for measuring air pressure, the actual air pressure is expressed in a unit known as millibars. For conversion purposes 75 centimetres that is 750 millimetres are taken to be 1000 millibars. Thus it is easy to convert the height of the column of mercury in millimetres into millibars by multiplying it with 1.3 Generally the normal air pressure at sea level is 1,000 millibars. It decreases with rise in altitude and also as a result of rise in temperature.

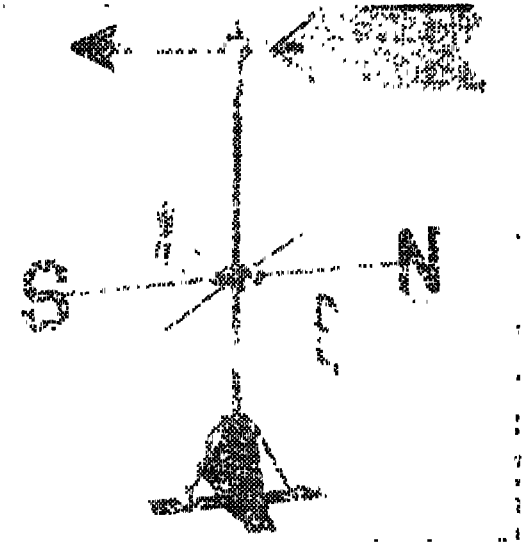
The instrument used for measuring atmospheric pressure is called a *barometer*. This simple 'mercurial barometer' is rather cumbersome. Therefore, the Fortin's barometer and the aneroid baro-

meter are commonly used. The Fortin's barometer is mainly used in laboratories. On the other hand, the aneroid barometer being very light and handy is used in actual field and at high elevations.

The accurate measurement of air pressure at different places is very helpful to us in many ways. The variations in the atmospheric pressure from place to place give rise to horizontal movement of air, that is, wind. Air moves from a high pressure area to a low pressure area. Thus the air pressures found in different parts of the world at a given time help us to know the directions in which the winds would blow. You also know that a sudden drop in the barometer indicates the coming of a cyclone.

Wind—Direction and Speed

You must have seen weathercocks set up over the high towers of observatories. How do they help us? The weathercock always faces the direction from which the wind blows. The wind is named after the direction from which it blows. The instrument such as the weathercock used for finding out the direction of the wind is called *wind vane*. The word 'vane' means a revolving plate or a weathercock.



1. A Wind Vane

The arrow of the wind vane is always nosed into the direction from which the wind blows. What do the letters NEWS indicate?

Besides direction, we also want to know the speed with which the wind blows at a given time. This wind speed indicator is called *anemometer*. It generally consists of three or four half cups, or hemispherical cups, attached to a small machine which records the revolutions made by these cups. From this data the speed of the wind per hour is calculated in kilometres.

Sometimes you must have noticed that the smoke from the chimney rises just vertically into the atmosphere. It indicates that there is hardly any horizontal movement of air. At such a time the actual speed of the moving air is less than a kilometre per hour and the air is said to be calm. In a strong breeze you are able to use an umbrella with great difficulty. On such an occasion the speed of the wind is about 40 kilometres per hour. In big storms, when widespread damage is caused, the wind speed is about 100 kilometres per hour or a little more.

Weather Forecast

So far, we have seen what the "Today's Weather" column tells us about the weather conditions of the previous day. We have also noted how the wind direction is noted and the wind speed is found out. As we have seen, the Today's Weather column tells us even something more. It indicates in advance the type of weather we should expect for the day. This is what is known as *weather forecast* for the day.

You may be interested to know how they are able to predict weather. Indeed it is an interesting story to know. To begin with, you must know that the detailed information of the daily weather conditions is recorded at a few hundred places all over the country.

The places where such data about daily weather are recorded are known as *weather stations*. Besides these weather stations, the

ships plying on the Indian Ocean also record the data about weather. Why is the data regarding the atmospheric conditions over the high seas necessary? The persons working at the stations and on the big ships report everyday these data telegraphically or through wireless to the Central Observatory at Poona. In addition to this, the data regarding the upper layers of the atmosphere are now collected through balloons, rockets and man-made satellites. This information is shared by several countries of the world.

At the Central Observatory at Poona, a large number of highly trained persons are busy all the time in recording and plotting these data on different maps.

Climatic Maps: There are several kinds of climatic maps. Some deal with the distribution of temperature. It is done by drawing isotherms. You already know what the isotherms are and how they are drawn on maps. An isotherm-map shows temperatures of a number of places at a given time, presuming that all the places are situated at sea level. This is done by reducing the temperature of different places to the sea level. Do you remember how and why it is done?

Some climatic maps show the distribution of rainfall. Rainfall of a given period is shown on maps by lines which join the places having equal amount of rainfall. These imaginary lines on a map joining places having equal amount of rainfall during a certain period of time are known as *isohyets*. Look at figure 4 showing annual average rainfall all over the world. Name the areas having rainfall more than 200 centimetres per annum.

Some climatic maps show the distribution of atmospheric pressure. This is shown on a map by drawing lines joining places having the same atmospheric pressure. These lines drawn on the map are

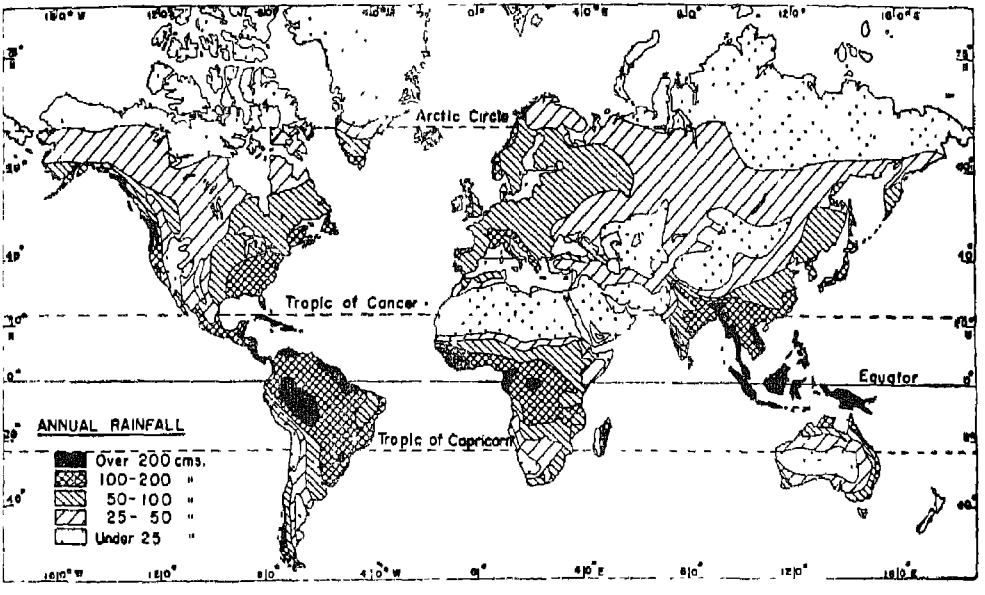


FIG. 4. *World—Mean Annual Rainfall*

This map gives us an idea about the distribution of annual rainfall all over the world at a glance. Note the isohyets of 25 centimetres and of 200 centimetres Where do you find the rainiest and the driest regions in the world?

known as *isobars*. Here also it is presumed that the places are situated at sea level. The pressure recorded at each place is calculated accordingly.

A Weather Map: A map containing information about weather conditions of a given area at a specific time is known as *weather map*. Unlike the maps you have studied earlier the weather map contains information regarding several elements of weather observed at a given time. Therefore, this map is found very handy for studying weather conditions as they are obtained over a wide area. It proves highly useful in predicting weather for the next 12 to 48 hours.

Weather Bulletins: After studying these maps carefully the specialists working in the observatory prepare weather bulletins every-day for the whole country or the large zones.

A weather bulletin sums up the weather conditions observed during the past 24 hours and then goes on to predict with a reasonable certainty, what kind of weather could be expected in different parts of the country. Apart from the Central Observatory at Poona, there are a few regional observatories like the one in Delhi. They also do this kind of work for their respective zones.

THE NEW TERM YOU HAVE LEARNT: *Weather Forecast*—Prediction with a reasonable amount of certainty the conditions of weather that would prevail in the coming 12 to 48 hours over a certain area.

EXERCISES

Review Questions

1. What do you mean by the following statements?
   (i) The minimum temperature at Srinagar was 0°C on March 10.
   (ii) Cherrapunji had a rainfall of 98 millimetres on July 1.
   (iii) The maximum relative humidity at Delhi was 80 per cent on June 25.
   (iv) The atmospheric pressure at Port Blair was 1008 millibars on June 10.

2. Given below are various elements of weather in the first column and the units in which they are measured in the second column. Make out correct pairs from the two:

(a) Temperature	(i) millimetres
(b) Humidity	(ii) per cent
(c) Rainfall	(iii) degrees of centigrade
(d) Relative humidity	(iv) grams per cubic metre
	(v) kilogrammes per square metre

(e) Air pressure	(vi) kilometres per hour
(f) Wind speed	(vii) millibars

3. Give a single term for each of the following:
   (i) A map showing various elements of weather prevailing over a large area at a specific time.
   (ii) A unit used for expressing atmospheric pressure.
   (iii) Imaginary lines on maps passing through places having the same amount of rainfall.

4. Given below are the names of certain weather instruments in the first column and their functions in the second. Make out correct pairs from the two:

(a) A wind vane	(i) finding out the highest and the lowest temperatures of air for a given period
(b) An anemometer	(ii) finding out wind direction
(c) An aneroid barometer	(iii) measuring precipitation
	(iv) finding out wind speed
(d) Six's thermometer	(v) measuring atmospheric pressure

5. What is atmospheric pressure? Explain how a simple mercurial barometer helps to measure it.

Map Work

6. From the data given below prepare a rainfall graph for Bombay city. The rainfall and temperature graphs given elsewhere in this book would serve you as a model...

Months—	J.	F.	M.	A.	M.	Jn.	Jy.	A.	S.	O.	N.	D.
Millimetres—	2	2	0	0	18	506	610	369	269	48	10	0

Use a graph-paper to draw this diagram. You may show 4 millimetres of rain by a length of one millimetere on your paper.

Write three important facts that strike you most about the rainfall of Bombay.

Topic for Class Discussion

7. *How Weather Forecast Helps Us*

Discuss this topic in your class after assigning the role of a farmer, a pilot of an aeroplane, a captain of a ship, a sailor of a fishing boat and an engineer in charge of a river dam to different students among yourselves.

3

The Changing Face of Our Land (I)

THE TERMS YOU ALREADY KNOW: *Earthquake*—Vibrations or shakings caused in the earth's crust by sudden movements inside the earth. *Volcano*—A vent or an opening in the earth's crust through which rock fragments, lava, ash, steam and other gases rise to the surface in course of an eruption.

THE face of the earth is not the same everywhere. It changes from place to place. But more so, it also changes from time to time. The face of our earth is being constantly modified both by man and nature.

How Man Changes the Face of Our Land

Man brings about a change on the face of the land in various ways. He builds huts and houses. He constructs roads and railways. He spans big rivers by building bridges. Occasionally new townships spring up around big factories and other places of work. Dams are constructed to create artificial lakes. Canals are, in a way, man-made rivers made to flow as he wants them to. Large tracts of forests are cleared in order to bring the land under the plough. So are grasslands and pastures converted into farmlands.

What Nature Does to Change the Face of Our Earth

Perhaps more spectacular is what nature has been doing all along to change the face of our land. You know how drastic changes are brought about by nature very abruptly. Mere mention of earthquakes and volcanoes should be enough to refresh your memory. Nevertheless, equally interesting are the other natural agencies that are constantly at work in bringing about a slow but steady change in the natural landscape.

Nature has been busy at its work of changing the face of the land right from the beginning of the earth. As against this, man has appeared on this planet rather recently. If the total life span of the earth to this date is taken to be twenty-four hours, it is believed that man has appeared on the earth only during the last five minutes. Even within this relatively short span of time man has been really effective in changing the face of the earth for not more than the last one second.

Examples of Major Changes on the Earth's Surface

You already know that some mountains are very old; and others are relatively young. For example, the Aravallies in Rajasthan are one of the oldest mountains in the world. So are the Urals in Siberia. You know that today these old mountains are very low and have rounded features. At one time these mountains were as high and picturesque as the Alps or the Himalayas. Today, all we know about them is that they have been worn down through the ages. Now you would not be surprised to know that this process was indeed spread over millions and millions of years.

You must have also read about the area which now forms the Indo-Gangetic Plain. It was at one time covered by a shallow sea named the

Tethys. Over a period covering millions of years, it had been gradually filled up. The Indo-Gangetic Plain of today is made up of fine silt brought down by the rivers from the Himalayas on the one hand, and the northern slopes of the Indian Peninsula on the other.

The areas now covered by the Valley of Kashmir in India and the Plain of Hungary in Europe were once occupied by big lakes. In course of time they have been filled up by fine silt brought down from the surrounding mountain ranges.

Continuous Levelling of the Earth's Surface

The forces of nature are thus busy at work "wearing down" relief features like mountains and plateaus. This you may like to describe as a destructive activity. The same forces of nature are also responsible for "filling up" low lying areas such as the sea or lake basins. Is it not a constructive activity? This continuous process of levelling the earth's surface is known as *gradation*, where the word 'grade' stands for levelling.

The over-all process of gradation has two distinct aspects: one is wearing down and the other is filling up. The wearing away or levelling down of the earth's elevated features is known as *degradation*. It is also known as *denudation*.

Filling up the natural depressions or levelling up the earth's surface is called *aggradation*. It is also known as *deposition*.

Agents of Gradation

What are the natural agencies involved in the process of gradation? Running water, ground water, moving snow and ice, wind and sea waves are the chief natural agencies responsible for gradation of the earth's surface. A natural agency capable of eroding and transporting earth material is known as *agent of gradation*. Each one

of these agencies is constantly busy at both destructive as well as constructive activity, that is work of degradation as well as aggradation.

How Rocks Break into Pieces

The process of degradation or denudation begins when rocks begin to break up into fragments and loose rock materials. But how do rocks break up or disintegrate into rock fragments? This takes place in various ways.

The outer layers of rocks exposed to the atmosphere are heated during day time by the sun's heat. As a result of this heating, the outer layers of rocks tend to expand. On the other hand, during night when the temperature of air drops considerably the outer layers of rocks contract. This results in loosening the outer parts of the rocks which finally break away from the main rock.

Cracks are also developed into rocks as a result of alternate expansion and contraction of their outer layers. In cold climatic regions, if water happens to enter into such cracks it is generally frozen by night. You are already aware of the peculiar behaviour of water. It actually expands when it freezes into ice. As a result the cracks already developed inside the rock are further widened. This progressive widening of cracks ultimately splits the rock into pieces.

Sometimes a rock comes in contact with water. Some of its soluble minerals like rock-salt get dissolved into water and are removed from it.

Roots of plants and trees are also responsible for developing cracks into rocks and breaking them. Even animals and man often lend their helping hand in the process of disintegration of rocks.

The breaking up or decay of exposed rocks by changes in temperature, freezing of water and the action of plants, animals and man is collectively known as *weathering*. This weathering, owing to the

exposure to atmosphere, is generally followed by yet another process. The weathered rock material is removed from the place of its origin to its next resting place. This is known as *erosion.*

Erosion which includes both weathering and transportation is then followed by aggradation or deposition. Now let us see how different agents of gradation are constantly busy at changing or modifying the face of the earth. Of these agents of gradation, running water is perhaps the most important.

Work of Running Water

As you know, most of the rain water is drained into a river. Barring a few exceptions, the river, in turn, ultimately empties itself into the sea. Thus the rain water returns to its original source from which it had come. This cycle of water—from ocean to the land, and from land to the ocean—goes on endlessly.

Rain water which runs off the ground causes widespread erosion in different ways. Heavy and incessant rain in hilly regions very often causes large chunks of brittle rocks to slide down. This sudden downward movement of a large mass of earth or rock from a mountain is called *landslide.* Landslides causing loss of life and property are common in various parts of the Himalayas, especially where the rocks are loose or not firmly fixed.

Rain water is responsible for washing away the layers of soil, on a much larger scale. This kind of surface erosion is the most widespread and is known as *sheet erosion.*

While moving down the slope in an uneven terrain, rain water scoops out the soil, forming small deep channels called gullies. These gullies gradually multiply and spread over a wide area. This is known as *gully erosion.* It causes great damage by making the land unfit for agriculture. If you happen to travel between Gwalior and Agra, you would be able to see how a maze of gullies has been formed. No

wonder then if these deep gullies have become ideal hide-outs for dacoits in this region.

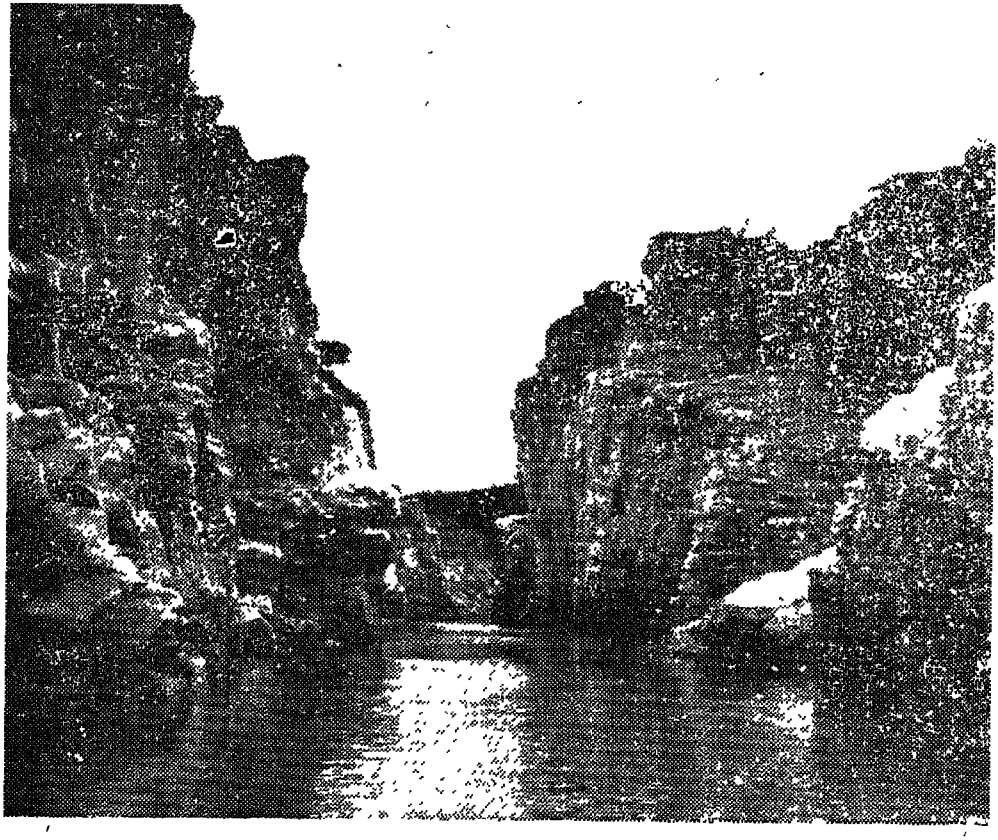
Work of a River

A river is not the same every where. If you happen to see it in a hilly region, you would find it very active even though the volume of its water may be small. Further downstream, especially in the plains, the river winds its way rather leisurely in spite of a great volume of water. In its lower reaches, that is in coastal regions, it moves very sluggishly before it joins the sea. It would be interesting to follow the journey of a river from its source to the mouth. This may be conveniently divided into three stages—upper course, middle course and lower course of a river.

Upper Course: In a hilly or mountainous region a river flows very swiftly on its way because of steep slopes from place to place. Here the river water is further armed with pointed stones and rock materials which it carries along with it. The river, therefore, actively wears away both its banks as well as its bed. The narrow valley through which it flows in this region is thus both widened and deepened steadily.

Boulders and pebbles moving with the strong current of a river keep on constantly rubbing against one another. They also rub against the rocky bed of the river. In the process they get rounded and worn down. Thus a river in its upper course is busy in denudation, that is erosion and transportation. In its upper course, it develops quite a few typical land forms like gorges, V-shaped valleys and waterfalls.

If a river flows through an area made up of hard rocks and having a little rainfall, it generally forms a narrow valley with steep or almost vertical walls. Such a deep narrow valley bounded by steep or vertical walls is known as *gorge*. It is the result of a down-cutting action of a river.



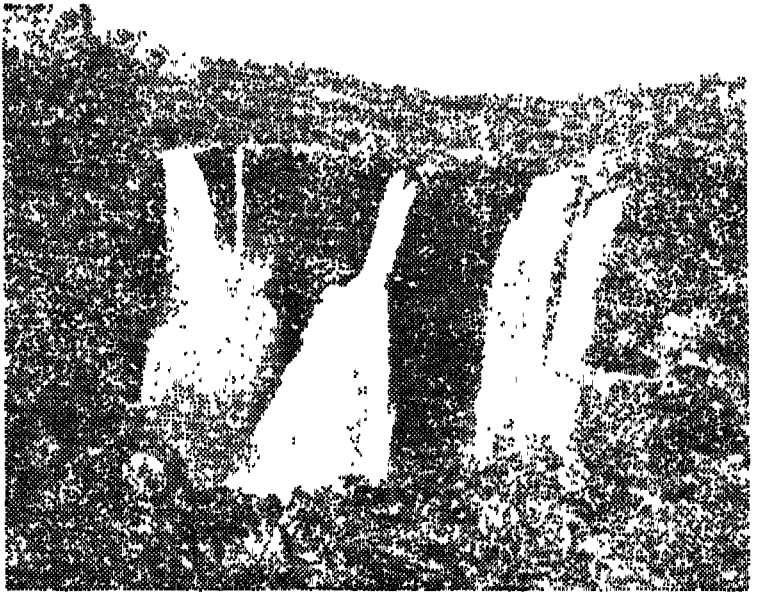
II. A River Forcing its Way through a Gorge

The Narmada has been flowing through this narrow gorge less than twenty metres wide. The gorge extending over three kilometres has been cut into marbles and Deccan Traps. Why is a gorge called an I-shaped valley?

Some areas are made up of relatively soft rocks and receive a heavy rainfall. In such regions, the sides of the river valley are quickly weathered and eroded by rain water. Thus with its sides sufficiently widened the river valley acquires a typical V-shape. Such valleys are, therefore, known as *V-shaped valleys.*

A *waterfall* as you know is a sudden descent of water over a big

vertical step formed in a river bed. It is generally formed at the edge of a hard rock overlying a soft one. In case of a waterfall, the river tumbles down almost vertically along its course. Sometimes it just hops, skips and leaps forming *rapids* on its way. A series of rapids big and small are called *cascades.*



III. Jog Falls The river Sharavathi tumbles down about 260 metres in a single leap. How are such waterfalls formed and how best can they be put to the service of man?

In brief, it may be described that a river in its upper course is very active and naughty. It gives you the impression of being in a great hurry. It is, therefore, said to be in its "youthful stage." Its major work is to erode and wear away the land through which it flows.

Middle Course : The river, after leaving the hilly region, generally flows across a plain. As the land is almost flat and low, the river considerably slows down its speed. It now winds its way more leisurely. It widens its bed by eroding its banks. It thus widens its valley floor.

Owing to occasional floods a flat valley floor is covered with mud brought down by the river from its upper reaches. A flat valley floor covered with alluvium brought by the river is known as *flood plain.*

In a wide and flat flood plain, the river winds its way leisurely forming big loops. These big loops formed by the river in its food plains are known as *meanders.*

In spite of the greater volume of water, the river in its middle course seems to move with restraint. It is, therefore, said to be in a "mature stage." Its major work lies in transportation and deposition, at this stage.

Lower Course: The river in its lower course is mainly busy with *deposition.* It deposits fine alluvium—mud and silt—not only on its flood-plain but also on its own bed. As a result the river channel is frequently blocked. This makes a river either change its course from one side of the flood-plain to the other, or divide itself to by-pass the deposits it has left in its own channel. The numerous channels into which the river is forced to divide itself before reaching the sea are known as *distributaries*—just the opposite of tributaries. As you already know this is how the deltas are formed by rivers near their mouths.

As the region is extremely flat and low and there are obstructions in the way, the river flows very sluggishly. Therefore, the river in its lower course is often described to be in its 'old stage.'

Now you would know that not only men, animals and plants, but the mountains and rivers also pass through a cycle of life consisting of youth, maturity and old age. Is it not very interesting?

THE NEW TERMS YOU HAVE LEARNT: *Gradation*—The continuous process of levelling the earth's surface. *Denudation*—Wearing away of the earth's surface; it includes both erosion and transportation. *Weathering*—Breaking up or disintegration of exposed rocks by natural agents.

EXERCISES

Review Questions

1. Give three examples for each of the following:
   (i) Changes brought about on land by man.
   (ii) Very slow but significant changes brought about in the earth's surface by nature.
   (iii) Sudden and drastic changes brought about on land by nature.

2. Distinguish between:
   (a) Aggradation and degradation.
   (b) A V-shaped valley and a gorge.
   (c) A tributary and a distributary.

3. Given below is a list of landforms developed by a river along its course. Rearrange them in the logical order in which you would come across them if you start your journey at the source of a river and end it where the river joins the sea.
   (i) Flood-plain; (ii) V-shaped valley; (iii) Delta; (vi) Waterfall; (v) Gorge; (vi) Cascades; and (vii) Meander.

4. Fill in the blanks with suitable terms:
   (i) Sudden downward movement of a large mass of earth or rock is called ...
   (ii) Washing away of layers of soil over a large area is known as .....erosion
   (iii) Small deep channels scooped out in the soil by rain water are called.....

5. What is gradation? Give examples of two distinct aspects of gradation.

6. Name the agents of gradation and explain the work of a river in its upper course

Map Work

7. In your atlas take out the relief map of India and see where you would look

for the following :

(a) a delta; (b) a meandering course of a river (c) a major tributary of the Ganga; (d) distributaries of the Krishna; (e) a river disappearing in a desert; and (f) a big waterfall of a small tributary of the Cauvery.

Topic for Class Discussion

8. Journey of a River

Imagining yourself to be a river, write a graphic account of your journey from the source to the mouth. Read out this autobiographical account of a river to your class.

4

The Changing Face of Our Land (II)

THE TERMS YOU ALREADY KNOW: *Glacier*—A slow moving mass of snow and ice. *Ice Cap*—Vast areas covered with deep ice and snow for a considerable time.

BY now, you know how wonderful are the ways of running water in modifying the face of land. Yet no less interesting is the slow but steady work of moving ice, winds and sea waves.

Occurrence of Ice

As you know, snow and ice are always found only in the extremely cold areas. Can you tell what must be the maximum temperature of the atmosphere where snow and ice are permanently found? Such areas having very cold climate are generally situated near the poles. They are also found at very high altitudes irrespective of their distance from the equator. How will you explain this fact?

Our country is situated nearer to the equator than to the pole. Therefore, the areas permanently covered with snow and ice are confined only to the high mountain ranges.

In certain areas, more snow falls each year than what melts there. As a result, the areas are permanently covered with snow and ice. They are known as *snow-fields*. The lowest limit of perpetual snow and ice is called *snow-line*. Snow-fields are, therefore, always situated above the snow-line.

In the equatorial region, the snow-line lies only at a very high altitude of more than 5,500 metres above sea level. Can you name two places one each from Africa and South America where the permanent snow-fields are situated very close to the equator? Find out the height of permanently covered snow peaks in these two regions.

In the Himalayas, the snow-line lowers down to an altitude of about 4,250 metres above sea level. In the polar regions where it is always very cold it drops down to the sea level. As a result most of the Arctic Ocean is permanently frozen. You may recollect that Greenland and a large number of islands lying north of Canada are permanently covered with snow and ice. Do you also recall that the whole continent of Antarctica is permanently covered with snow and ice? Such a vast area covered with deep ice is known as *continental ice sheet* or *ice cap*.

The continental ice caps of today are thus confined only to polar regions. They are fewer and smaller than what they were at times in the past. However, it has been found that in the past the polar ice caps had advanced towards the equator covering the northern areas of North America and Eurasia. Such periods when very large parts of the earth were covered with ice sheets or ice caps are known as *ice-ages*. Today we are living in a period when the ice caps have shrunk retreating towards the poles.

Work of the Moving Ice

Ice caps and snow-fields give rise to glaciers. As you know,

glaciers are slow moving rivers made up of huge quantities of snow and ice. They crawl as it were at a rate of only a few metres per day. Gangotri and Jamnotri are the two famous glaciers of our country.

IV. Tasman Glacier in New Zealand

Look at the river of snow and ice crawling under its own weight. What kind of a valley should it develop in due course?

A glacier is responsible for modifying the face of the land in a variety of ways. It causes erosion as well as deposition. Glaciers, like rivers of water, also form valleys of their own. A hard and heavy mass of ice further armed with pieces of rocks goes on grinding a valley bottom as well as its sides. As a result, the valleys formed or modified by glaciers, have flat bottoms and steep or vertical sides. Because of their typical shape they are called *U-shaped valleys*.

Glaciers carry pieces of rocks, big and small, along with them. They are often left on the way at certain places. Such deposits dropped by the glaciers are known as *moraines*.

Work of Wind

Wind is yet another important agent of gradation. It is responsible both for degradation and aggradation. It is, however, more effective in desert regions where there is neither running water nor moving ice.

In the absence of any moisture and vegetation, particles of soil get easily loosened in arid and semi-arid regions. They are freely picked up and carried away by the wind. Strong winds pick up and carry not only fine soil or dust but also sand and gravel. Heavy and frequent dust storms remind us that they too are responsible for eroding fine and fertile top layers of soil.

You already know how [redacted] deposits are formed far away from where the fine soil or dust particles were picked up by the wind. The slow but steady work of the wind spread over tens of thousands of years has resulted in developing these deposits hundreds of metres deep.

One typical landform developed in a desert is the sand dune. This is a result of deposition by wind. A *dune* is a hill of sand and has a crest or a summit. It is somewhat mobile as it keeps on rol-

ling or shifting, of course, slowly along the direction of the prevailing winds. It originates at places where there is some small obstruction in the path of the wind. Dunes vary in size. Their height ranges from a few metres to as much as 300 metres.

Work of Sea Waves

The sea is also an important agent of gradation. Its work of erosion and deposition is obviously confined to the coastal areas.

Strong sea waves, dashing day in and day out against the coast, are able to break down hard rocks. They are further aided in their work by the presence of loose pieces of rocks and sand in them. They act as cutting tools of the sea waves. Coastal erosion caused by the sea waves is known as *marine erosion.*

Sea waves are also responsible for deposition. Pieces of rocks, gravel, and mud are being constantly sorted out and deposited along the coast or on the sea bed itself by sea waves and currents. The marine deposits along the shore modify the coast lines in several ways.

At places sand, gravel and pebbles get deposited temporarily on the shore. They are called *beaches.* Triplicane or Marina Beach in Madras is a famous beach in India. It attracts a large number of tourists.

Sometimes embankments of sand and gravel get built up on the sea floor not far from the coast. They are called *bars.* Very often they prove a hazard for shipping along the coast.

Occasionally a sand bar almost cuts off a portion of the sea or a bay from the main body of sea water. This results in the formation of salt water lakes along the coast. They are known as *lagoons.* Lagoons are able to maintain a connection with the open sea through a narrow outlet. In India there are several lagoons along the Malabar coast. On the east coast there are two large lagoons. They are the Chilka lake in Orissa and the Pulicat Lake near Madras.

We have thus seen how the various natural agencies are at work in changing the face of the land. How ingenious are the ways of nature that develop a variety of landforms steadily and stealthily!

Formation of Soil

Soil is the greatest natural resource for man. All our food is derived from soil directly or indirectly. Have you ever thought how even the animal products like meat, milk and butter in a way come from the soil?

We owe a good deal to the natural process of weathering and erosion. But for this process there would not have been any soil which man tills to raise a variety of crops. The formation of soil through the natural process of weathering is a very slow process. It may take about a thousand years to have a layer of soil two-and-a-half centimetres thick.

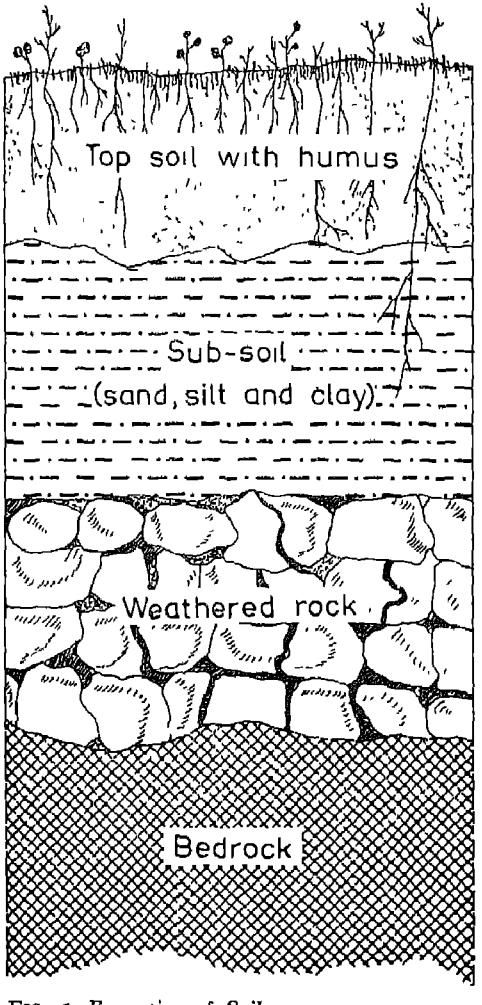


FIG. 5. *Formation of Soil*

Look at the various layers, indicating the stages in the formation of soil. What is top soil?

You will notice that the soil is derived from rocks. The upper layers of rock gradually break into sizable pieces of rocks. They in turn give place to smaller pieces of rocks and silt. This is known as sub-soil. At long last we get a fairly thick top layer of soil which is so useful to us for deriving our food. In fact, soil which is of great use to us is the upper-most layer of the earth's crust. It contains a fine powdered mineral material and humus. *Humus* as you know is a very fine material derived from the remains of plants and animals. It is the presence of this humus which makes the soil fertile.

Presence of grass, plants and trees on the land is very useful for us in a variety of ways. Their remains add to the humus content of the soil and make it fertile. The roots of the vegetation also help in binding the top layer of soil. This prevents it from being carried away by water or wind.

Conservation of Soil

Unfortunately, very often man ignores the usefulness of natural vegetation. He fells trees and clears forests. He removes grass and other natural vegetation either himself or by allowing his domesticated animals to overgraze. Such bare and uncared for soil is eroded both by running water and wind. Sheet and gully erosions are the two well known types of soil erosion. These need to be avoided at any cost. Why? As you know it is possible that the soil which was developed by nature in the course of a thousand years can be carried away by running water and winds in a few years merely to be deposited into the sea. If we want more and more food for our ever growing population, can we afford to neglect our soils?

It is because of this that our government and intelligent farmers take great care to conserve our soil. This is done through several means. We must put an end to the reckless felling of trees or clear-

ing of forests. Every effort must be made to plant more and more trees. This is why we celebrate 'Vanamahotsava' every year. We must not allow our cattle, sheep, goats etc. to overgraze. Farms should be properly levelled and bunded. In hills the terraced farms are more paying since they are well levelled and properly bunded. This helps in the conservation of soil as well as water. In fact we cannot do without either.

THE NEW TERMS YOU HAVE LEARNT: *Snow-line*—The lowest limit of the perpetual snow and ice. *Ice-age*—A considerably long period during which very large parts of the earth were covered with ice sheets or ice caps.

EXERCISES

Review Questions

1. Answer the following questions:
   (i) What is a snowfield? How and where is it formed?
   (ii) What is the average height of a snow-line in the Himalayas?
   (iii) Where do we find the largest ice cap?

2. Make out correct pairs from the two columns:

(i)	The lowest limit of perpetual snow and ice	(a)	Ice cap
(ii)	A vast area covered with deep ice	(b)	Glacier
(iii)	Slow moving rivers of ice and snow	(c)	Marine erosion
(iv)	Gradual breaking up of rocks and their carrying away by sea waves	(d)	Beach
		(e)	Snow-field
(v)	Pebbles, sand and gravel temporarily deposited on the shore	(f)	Snow-line

3. Complete the following table as indicated from the list of land forms given below:
   (i) lagoons; (ii) sand dunes; (iii) loess plateaux (iv) gulleys; (v) U-shaped

valleys; (vi) beaches; (vii) V-shaped valleys; (viii) moraines; (ix) sand bars; (x) flood plains; (xi) deltas; (xii) gorges.

Agent of Gradation	Land forms due to erosion	Land forms due to deposition
Running water	V-shaped valleys	
Moving ice		
Wind		Sand dunes
Sea waves		

4. Explain how soil is formed. List various steps that must be taken to conserve soil.

Model Making

5. Prepare suitable clay models of various land forms such as a V-shaped valley, a delta, a sand dune, a U-shaped valley and a gorge. Prepare suitable labels for your models giving a definition of each one of them.

Topic for Class Discussion

6. *Vanamahotsava and its Usefulness*

Discuss how plantation of trees on a large scale should help in conserving soil and water. Also discuss how you can help in conserving soil and water.

UNIT TWO

EUROPE—A POPULOUS YET PROSPEROUS CONTINENT

Europe is at best a peninsula of the Eurasian continent. However, for its size it is very important. No other continent has left its impact on the rest of the world as Europe has done during the past three centuries or so.

Europe is the only continent which is both populous and prosperous. Therein lies the greatness of Europe, not withstanding its small size.

The secret of Europe's prosperity lies in certain qualities of an average European who is indeed very hard working. He believes in making the best possible use of the natural resources, bringing in its wake the prosperity to him and to his country as well.

France and the United Kingdom are the two West European countries that were in the forefront for quite sometime in Europe.

Norway, a North European country, lives more by sea than by land. Germany of Central Europe is a country that reminds us of a legendary phoenix bird which comes back to life from its own ashes. Italy is a South European country that reminds us of India in ways more than one.

The Soviet Union is a country that not only belongs to two continents but also dominates them by its very presence.

The following pages should, therefore, present to you some useful information that may be of interest to all of us in quickening the pace of economic reconstruction in India

5

Land and Climate

THE TERMS YOU ALREADY KNOW: *Land Hemisphere*—That half of the earth's surface which contains nearly six-sevenths of the world's total land area. *Peninsula*—A large stretch of land surrounded by sea on all sides except one through which it is connected to a large land mass.

As a continent, Europe is indeed very small. It is just three times the size of our country. Barring Australia it is the smallest continent. But Europe is very thickly populated; and yet it is prosperous too! During the past few centuries no other continent has left its impact on the rest of the world so much as has Europe. What made it so? Let us see how far the geography of Europe is responsible for it.

Look at the globe and you will find that strictly speaking Europe can hardly be called a continent. Why? It is at best a big peninsula of the continent of Eurasia. Nonetheless, Europe as a continent is very important for reasons more than one.

Study the picture of a globe. You will find that Europe occupies a central position in the Land Hemisphere. Also note the shape of this continent. Large arms of seas have penetrated deep into

Europe. Find out the names of these seas from your map. Can you think how their presence must have affected Europe?

Look at the coastline of Europe. It is highly indented. Obviously, it should provide a number of natural harbours and ports.

Many of the bays and seas surrounding Europe are shallow. They offer some of the best sites for fishing. This has led Europe to produce a large number of skilled and daring seamen. Many of these brave European seamen took to shipping and trade.

It is these great seamen who made the best use of the favourable location of Europe and its natural harbours. You know they discovered unknown lands and continents beyond the seas.

Discovery of new lands led to the establishment of colonies and empires. As was expected, these in turn helped to promote trade and commerce between Europe and the rest of the world.

The new sea routes became not only the carriers of trade but also the pathways along which marched new ideas, thoughts and culture. It thus became possible for Europe to leave its cultural impact on the rest of the world. Indeed, many of the ideas, movements and inventions born in Europe have influenced the life of people all over the world today.

Physical Features

Look at the map of Europe and note the degrees of latitude and longitude within which it is situated. This map will also tell you that Europe is a continent of mountains and plains. Broadly it may be divided into three major physical divisions. They are i) the Northern Highlands; ii) the Central Plains; and iii) the Southern Mountains.

Northern Highlands: The Northern Highlands include the mountains and plateaus of Norway and Sweden. They also extend

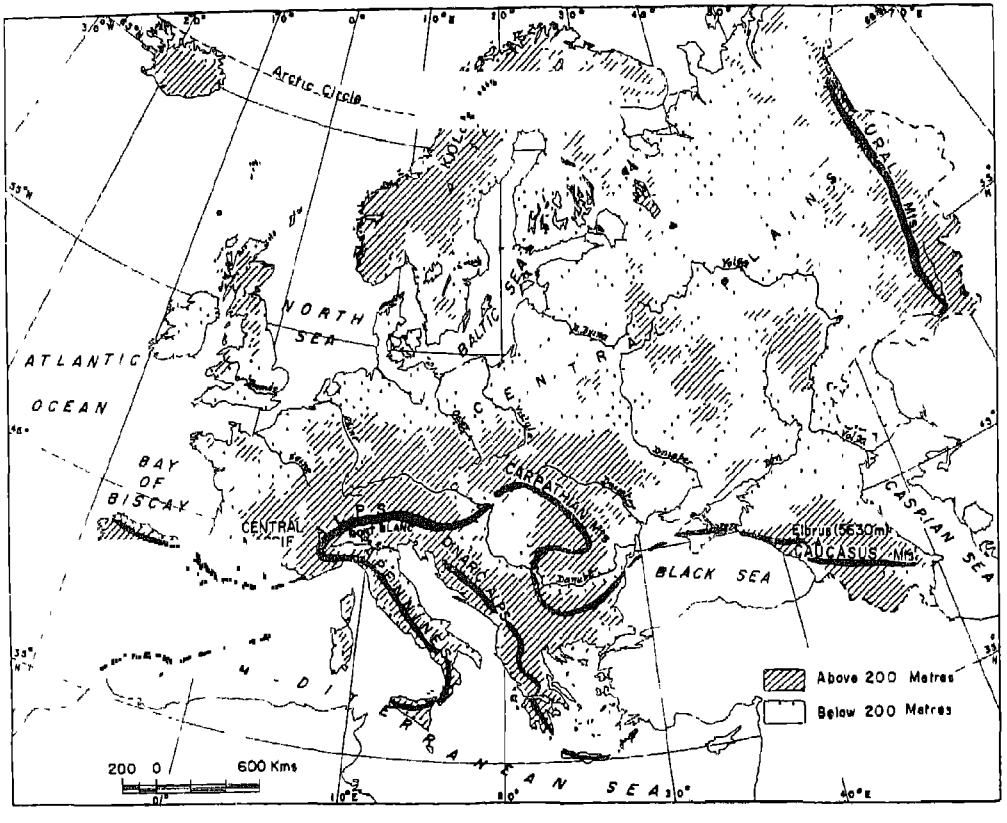


FIG. 6. *Physical Features of Europe*

Note the three distinct physical divisions of Europe Locate important rivers falling into the Caspian Sea, the Black Sea and the North Sea

into the northern parts of Scotland, Wales and Ireland. These mountains are situated close to the ocean; and their branches penetrate deep into the sea. They thus form highly indented and rugged coastlines. These mountains along with the Urals in the east are the oldest in Europe. Many of these mountains are low, and slope very gently away from the sea.

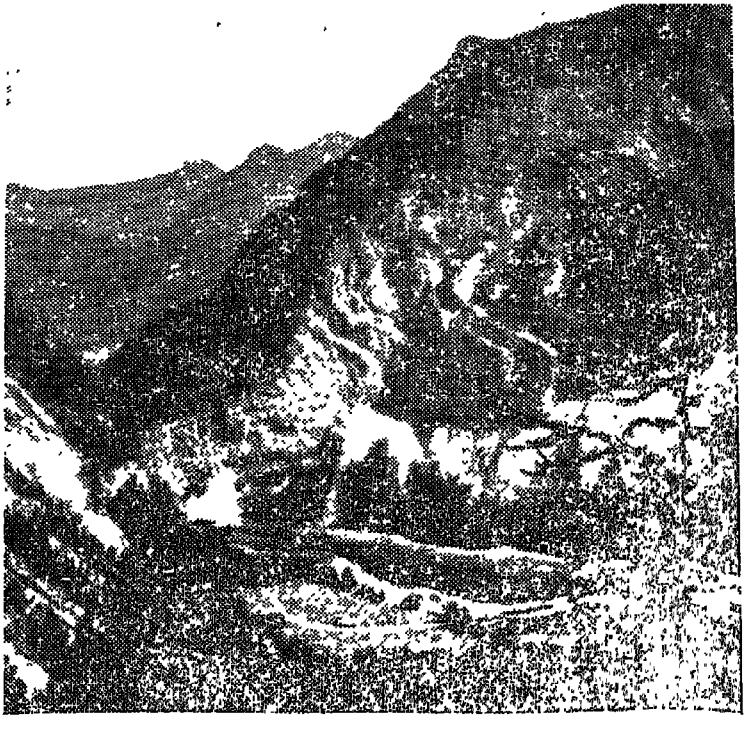
Central Plains: The Central Plains stretch between the Atlantic Coast in the west and the Ural Mountains in the east. To their north lie the Northern Highlands; and in the south are the Southern Mountains. Besides the Central Plains, there are small plains of Lombardy in Italy and the lowland of Andalusia in Spain, and the Plains of Hungary.

The Central Plains are drained by a number of rivers. The Seine and the Rhine are the important rivers that join the English Channel and the North Sea. Note from your map the other rivers that join the North Sea and the Baltic Sea. The river Danube flows to the east and falls into the Black Sea. The other two rivers joining this sea are the Dnieper and the Don. The Volga which is the largest river of Europe joins a land-locked sea named the Caspian.

Southern Mountains: Mountains lying close to the southern border of the Central Plains are also not very high. They have been considerably eroded in the past. In fact, these mountains today are only the stumps of the mountains which once were very high. Thus these too are old mountains; but not as old as the mountains in Scandinavia or northern Scotland. Important among these are the Central Massif of France, the Vosges, the Black Forests and the Plateau of Bohemia. Name the countries in which they are situated.

To the south of these old mountains lies a chain of very high mountains. It stretches from the Atlantic in the west to the Caspian in the east, from where it further extends into Asia. These mountains with high peaks, steep slopes and deep valleys are the youngest mountains of Europe. The most important mountain system among them is known as the Alps.

Mont Blanc is the highest peak of the Alps Mountains. You will find that this peak is only half as high as Mount Everest in the Himalayas.



V. The Swiss Alps
Look at this sunny view of the Alps in Switzerland. Note the folded rocks, forest-clad slopes, snow and scree. What suggests to you that it is a hill resort?

Besides the Alps, the other important mountain ranges in this group are the Pyrenees, Apennines, Dinaric Alps, Carpathian and Caucasus. Find out from your maps the countries in which they are situated.

The highest mountain peak of Europe lies in the Caucasus. It is known as Elbrus. It is nearly two-thirds the height of Mount Everest.

The ranges of the southern mountains generally run parallel to one another, forming folds as it were. It is believed that such *fold mountains* were developed when the land was gradually compressed from either side as a result of the internal movements beneath the earth's crust.

Climate and Vegetation

Note the degrees of latitude in which Europe is situated. You will find that the major part of the continent is situated in the cool temperate zone. In spite of its location and compact size the climatic conditions in Europe vary from region to region. This is because the climate of Europe is influenced by many factors. They are its relief, proximity to the seas, effects of the North Atlantic Drift and the westerlies.

The deep penetrating arms of the sea have a moderating influence on the climates of Europe. The warm waters of the North Atlantic Drift keep the seas surrounding Europe ice-free. The warming influence of these waters is carried further inland by the westerlies. In their wake they also pick up moisture and cause a fair amount of rainfall.

These permanent winds are responsible for a fairly well-distributed rainfall all through the year especially in the western parts of Europe. The rainfall is heavy in the west and along the western

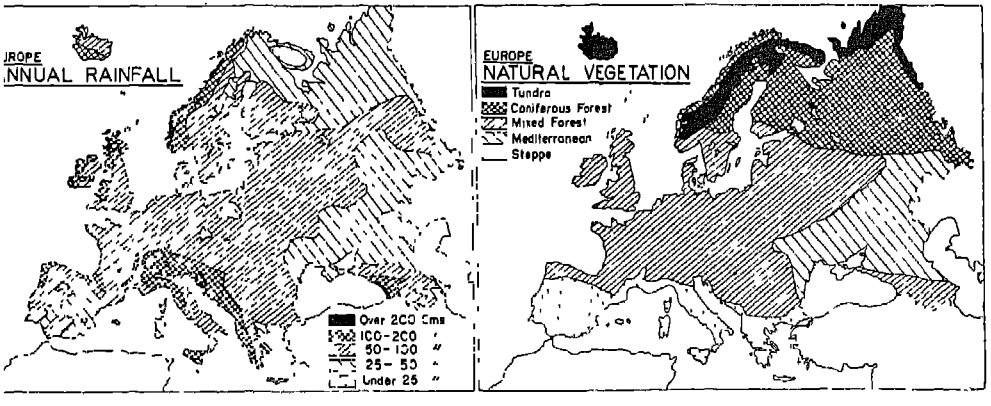


FIG. 7. *Rainfall and Natural Vegetation in Europe*

Note the rainfall and the natural vegetation belts of Europe. What correlation do you notice between the two?

slopes of the mountains. It decreases as one proceeds eastward, where it mostly occurs in summer.

In Western Europe, the moderating influence of the westerlies makes summers warm rather than hot. Winters too are cool rather than cold. In winter weather is often very foggy. The rainfall is well distributed all over the year. This is a typical *marine or maritime type of climate.*

In Eastern Europe, the climate is more continental in nature. The region is too far away from the sea to have any of its moderating influence. As a result the summers are very hot and winters very cold. Such a climate with a wide range of temperature is known as extreme type or the *continental type of climate.*

In Southern Europe, the rainfall is confined mainly to the winter months only. During summer this region comes within the sub-tropical high pressure belt. Existence of high pressure coupled with the off-shore winds rules out the possibility of rains. In winter, however, the high pressure belt shifts southward, leaving this region open to the influence of the westerlies. Thus, this region experiences a typical *Mediterranean type of climate* in which summers are hot and dry and winters warm and wet.

The land north of the Arctic Circle has an extremely cold climate. Precipitation is very scanty and is in the form of snow. Summers are brief, with days long and warm. This wind-swept region is covered with snow for the major part of the year. It is covered with the tundra type of vegetation that is moss, lichen and a few stunted trees such as willows and birches. The reindeer and polar bear are the common animals of the tundra region.

South of the tundra lies the belt of the taiga region. It is a region of coniferous forests with pine, spruce and fir as the common trees. These trees provide softwood and as such are valuable. The forests are also the abode of fur animals like lynx, sable and squirrel.

Further south lies a belt of mixed-forests. It consists of some coniferous trees of the taiga type. More common, however, are the broad leaved trees which shed their leaves in winter. They are called deciduous trees. Common among these are oak, ash and poplar.

In the Mediterranean region trees are required to stand a long summer drought. Therefore, the trees are small in size but have deep roots. Their leaves are small, generally thick and oily or glossy. This helps to avoid evaporation of water. Some trees are thorny and others have thick and pulpy barks. Olive, holm oak, cork-oak and stone pine are the common trees. Olive, fig, grape and orange are the well known fruit trees of the region.

In Eastern Europe, where rainfall is too meagre, the common vegetation is grass. It is coarse and found in patches. The region is known as the steppe grasslands.

Political Map of Europe

Europe is a compact continent. Almost all its inhabitants are white; and they follow Christianity in general. And yet for its size and compactness Europe has a great deal of diversity. It has, in fact, too many states. The continent with a very high density of population has become the homeland of several races, quite a few linguistic groups and a wide range of religious sects. All these have resulted in a very large number of nationalities.

Study the map carefully and name the largest country in Europe. Which country occupies the largest delta in Europe? Name four land-locked countries of this continent. Locate five countries of western Europe which had established large overseas empires. Name their capital cities. Locate the countries situated on the Mediterranean Sea. Which two of these countries are known for their ancient glory? Can you name their capitals? Which Central European country is now divided into two? Locate the countries of Norway,

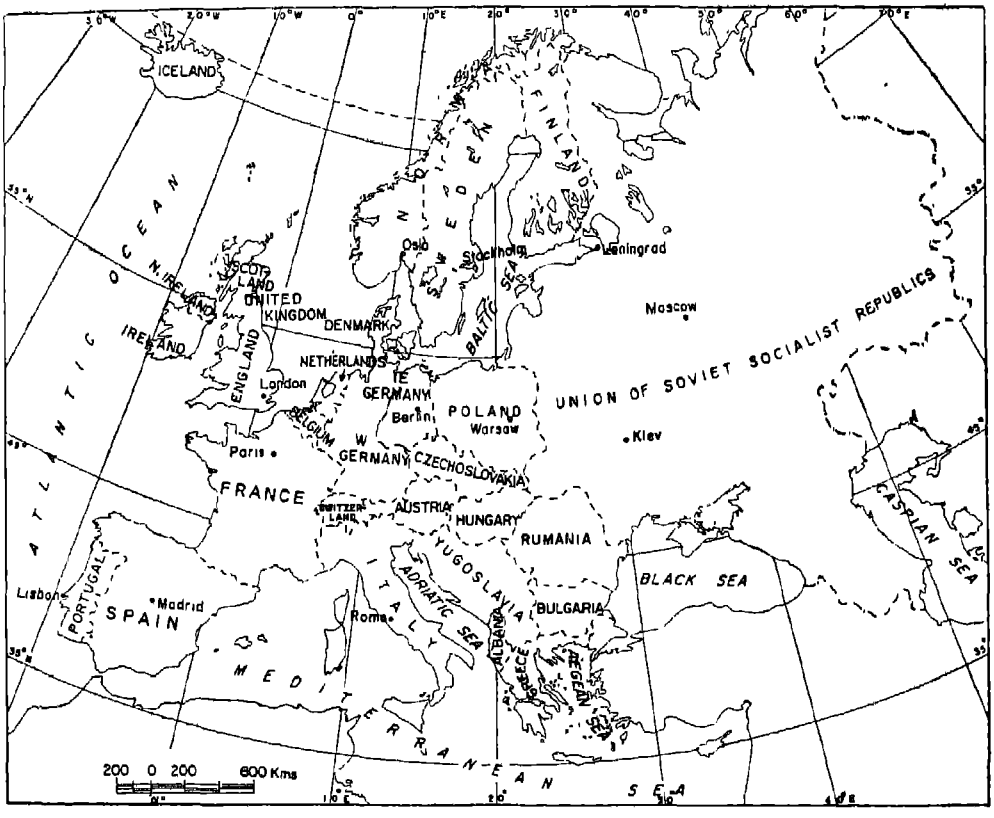


FIG. 8. *Political Divisions of Europe*

Note the European portion of the Soviet Union. What European countries have a common border with this country?

Sweden, Denmark and Iceland. Find out by what name they are collectively known.

THE NEW TERMS YOU HAVE LEARNT: *Fold Mountains*—Mountains with long parallel ranges. They are formed when the land gets gradually compressed owing to forces at work under the earth's crust. *Lacustrine Plain*—A plain formed as a result of deposits accumulated on the bed of a lake which in course of time has dried out.

EXERCISES

Review Questions

1. Answer the following questions:
   (i) What are the three major physical divisions of Europe?
   (ii) What is a land hemisphere?
   (iii) Name the channel that separates the British Isles from the European Main land.
2. Distinguish between:
   (a) The marine type of climate and the continental type of climate.
   (b) The taiga and Mediterranean types of vegetation.
3. Complete the following statement with a correct ending:
   Southern Spain receives winter rains because
   (i) it lies in the zone of the westerlies
   (ii) it lies in the zone of winter monsoons
   (iii) it attracts moist winds from the Mediterranean Sea
   (iv) sub-tropical high pressure belt shifts southwards in winter
4. Describe the three major types of climate found in Europe. How far are they influenced by the westerlies?
5. List the natural vegetation belts of Europe. Explain how the vegetation in the tundra and the Mediterranean region is influenced by climates of these regions.

Map Work

6. Study the map of Europe and then make the correct pairs from the following

(i) Iceland, Norway, Sweden and Denmark	Balkan States
(ii) Eire, Northern Ireland, Scotland, Wales and England	Low countries
(iii) Yugoslavia, Bulgaria, Greece, Rumania and Albania	Scandinavia
(iv) Belgium, Netherlands and Luxemburg	British Isles

Topic for Class Discussion

7. *The Great Seamen of Europe*

   Collect information on this topic and discuss it in your class. The following tips may help you:

   (i) Bartholomew Diaz; (ii) Vasco-da-gama; (iii) Christopher Columbus; (iv) James Cook; and (v) Ferdinand Magellan.

   Frame a suitable quiz at the end of your discussion and test your knowledge.

6

Gifts of Nature and the People

THE TERMS YOU ALREADY KNOW: *Mixed Farming*—Combination of cultivation of crops and rearing of animals for their milk and meat on the same farm. *Intensive Agriculture*—A farming practice involving greater use of man power per unit of land.

UNLIKE North America, Europe is a very thickly peopled continent. No continent as a whole is, in fact, more densely populated than Europe. Yet the amenities and comforts enjoyed by the common man in Europe are comparable to those of an average American. Here lies the greatness of modern Europe. What is it due to? This is explained by two facts, namely the gifts provided by nature and the wise use they have been put to by the people.

Europe is fortunate to have a large proportion of a level and well-watered lowland. Almost every inch of it has been brought under the plough. Lands in the hills which are neither so fertile nor so level are used as pasture lands. On them are fed some of the most cared-for cattle in the world. Hill and mountain slopes and tracts of infertile lands are wisely left under forests. Even the

forest trees are carefully nurtured.

Thus the Europeans use their land either for agriculture, or for animal rearing, or for forestry, depending upon the best possible use of every piece of land. Even the natural beauty of landscape has been made use of by turning it into centres attracting tourists.

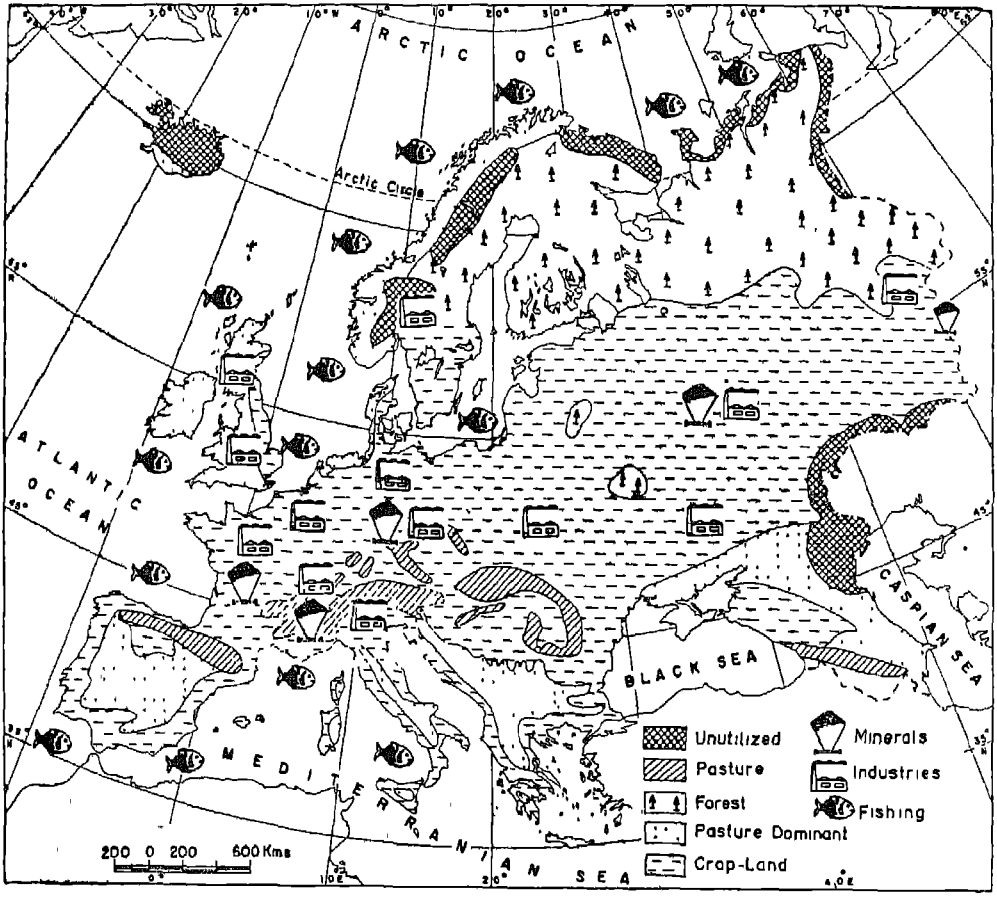


FIG. 9. *How the Land is Used in Europe*

Note the various ways in which land is used. Try to list the natural resources of Europe in the order of their importance.

Where the land has been found reluctant to provide adequate food for man, he has turned to the sea to make good this deficiency. Even the seas surrounding Europe have proved very kind to its imaginative, industrious and daring people. Many of them earn their living by taking to fishing, shipping and overseas trade or commerce.

The Europeans have never been content with what the nature has given them readily and bountifully. Do you know that the Dutch people have been constantly at war with the sea? Steadily and stealthily they have been wresting land from the sea by pushing it back and back. Their country is rightly known as Holland or Netherlands since it is a lowland. In fact, a part of it is below sea level.

In order to protect these newly claimed fertile lowlands from the sea they have built big embankments called *dykes* along the sea front. They protect land from being flooded by the sea. Formerly hundreds of wind mills were busy in pumping out water from these low lands into the sea. Now it is being done with the help of big pumps worked with electricity.

The searching eyes of the Europeans were never satisfied with resources available on the land's surface. Their imagination, followed by hands, had reached deep below the surface of the land. As a result they discovered very large underground deposits of coal and iron that were awaiting them. Thus the earth also has been exceptionally kind and generous to these people. These black twins —iron and coal—have helped Europe to develop several industries, big and small.

Europe is bestowed with one more gift of nature namely water, which it has used very wisely for development of water-power, inland navigation and also irrigation. In fact, the Europeans were the first

to develop power from running water and put it at the service of man.

Industries, a network of transport and the mastery over the seas have all led Europe to capture international trade. A very large proportion of it is very much in its own favour. This explains why Europe is populous as well as prosperous.

Exploiting Soil

Cultivating Crops : About a third of the total land in Europe has been brought under the plough. However, the quality of soil and climatic conditions are not the same all over the region. Therefore, a variety of crops are grown in different parts of Europe, depending upon soil, climate and availability of farm labour.

By far the most important crop of Europe is wheat. It is grown in all the three climatic types. The important wheat producing areas are the Ukraine in the Soviet Union, Paris Basin in France, the Central Plains of Europe, the low countries and the Po Valley in Italy. Wheat cultivation is confined to rich soils with cool but relatively long summers with abundant sunshine.

The poorer soils are devoted to barley, rye and oats in that order. Europe and the Soviet Union are the leading producers of these coarse cereals. They supplement wheat, the staple food crop of Europe.

Sugar-beet and potatoes are the important root crops of Europe. The Sugar-beet has the same importance to the Europeans that the sugarcane has for us. Potatoes, too, are used to supplement their food. These are grown in the plains of Central and Eastern Europe. Flax is the only fibre crop of Europe and is used for making linen. It is grown in cool damp lands, especially in the Soviet Union.

Fruits such as apples, olives, figs, grapes, peaches and oranges

are also grown in very large quantities. The orchards are confined to sunny hill slopes and stony soils of Mediterranean Europe.

Rearing Animals : Europe has nearly a fifth of its land, namely the meadows and pastures, left open for its animals. Well distributed

VI. A Polish Shepherd in the Hills

Note the smiling face of the shepherd and the decorated dress he has put on. Do you think that forestry and sheep rearing are the two correct uses of the land in the picture?

rains and cool summers ensure abundant and nutritious grass for its animals. Dairy cattle do very well in cool moist marine type of climate. They are carefully bred to ensure very high yield of milk. Countries around the North Sea are famous for dairying. Cattle are also reared for their meat. Pigs, since they multiply and grow very quickly, are reared on farms for pork. Sheep are confined to drier parts. They are reared both for wool and mutton. Poultry farming is a very common feature of Europe's agriculture.

Nurturing Forest Trees : About a fourth of the land in Europe is still left under forests, in spite of heavy pressure on land for agriculture. The Europeans realise that it would be unwise to further reduce its area under forests. Forests provide not only fuel and timber but also help to develop and conserve soil and water resources. They also help to preserve wild life without which man's life would become poorer. Forests in Europe are confined to Scandinavian and Alpine mountains and to the taiga region in the Soviet Union.

Harvesting the Seas

Europe possesses some of the rich fisheries of the world. Famous among them are the Dogger Bank and the Great Fisher Bank. Fish catch in Europe is well over ten million tonnes, giving Europe the highest consumption of fish per head of its population. Thus Europe is somewhat able to make up for its insufficient food supplies. Fish provides a valuable source of protein for a balanced and nutritious diet at a relatively low cost.

Exploiting Underground Wealth

Europe possesses large mineral deposits hidden under the land. By far the most important among them are coal and iron-ore. Coal is found in West Germany, the Soviet Union and the United Kingdom.

A low-grade variety of coal which is brittle and brown in colour is known as *lignite*. East Germany is its principal producer. Coal is the major source of power in Europe. It is now supplemented by water-power in an equally big way. They together make up for the lack of petroleum in Western Europe. The big reserves of mineral oil and natural gas are found in the Soviet Union and Rumania.

Iron-ore is found in France and the Soviet Union on a very large scale. Other producers are Sweden, the United Kingdom and Spain. Europe also produces bauxite, sulphur and potash.

Converting Nature's Gifts into Goods and Utilities

It is true that Europe has a wide range of natural resources. But what is really more interesting is the way they are wisely used by the people. Even in cultivating land they follow different methods. Where the land is abundant and the labour scarce they use big machines on their farms. Extensive agriculture is thus practised on large-sized farms where more and more machines are employed in place of human labour. In the areas where land is scarce but the labour is surplus, intensive agriculture becomes the rule. Where they find that raising of crops can be combined with rearing of animals they follow mixed-farming.

In order to maintain and improve the fertility of soil they use fertilizers, follow rotation of crops and employ other scientifc techniques. In dry lands of the steppes and the Mediterranean region they have readily taken to irrigation. For them agriculture has now become a scientific pursuit where every effort is made to increase the yields per unit of land and human labour.

Much of the agricultural produce is processed before it is consumed. In the process they have developed several industries, employing a large number of its people. A large number of mills are engaged

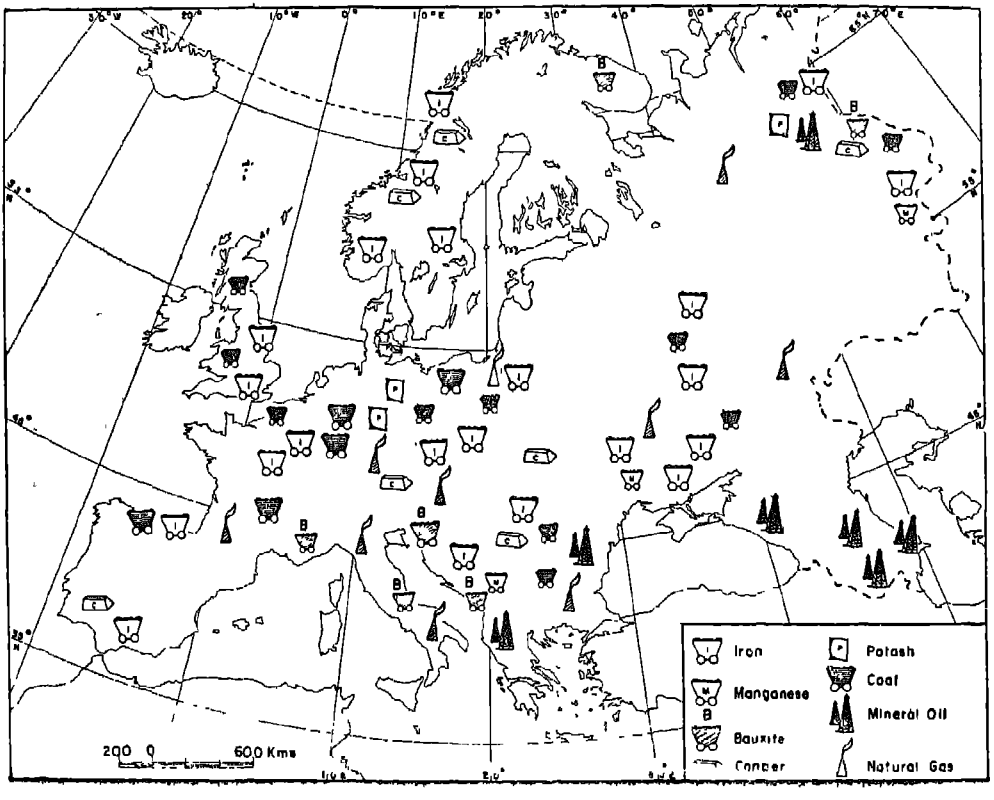
in converting wheat into flour. Bakeries, in turn, convert them into loaves of bread. Sugar mills are busy in manufacturing sugar from sugar-beet. Even fruits and their juices are now preserved in various forms and widely marketed.

Wool, flax-fibres and silk are now turned into textiles. The textile mills in Europe are busy not only in manufacturing woollen cloth and linen but they also produce cotton textiles, by importing cotton from other parts of the world.

Milk is converted into cheese and butter. Some of it is now

FIG. 10 *Europe—Distribution of Minerals*

Note the major coalfields of Europe. What relationship do you find between them and the industrial centres?



turned into condensed and powdered milk. These tinned dairy products enter into international trade on a big scale. The use of science and technology has gone a long way in changing milk, a perishable commodity, into prized articles of international trade.

Meat is also now frozen and tinned before it is marketed like many other commodities.

Logging and lumbering is now followed with several other industrial activities. Important among them is making of pulp and cellulose. Newsprint, paper, rayon and other synthetic fibres are produced from wood.

Fishing has now become a very complex operation. Deep sea fishing involves preservation of fish. Fish are marketed both fresh and as preserved products. Fish oil and fish manure are also now marketed on a large scale. There are allied industries which manufacture fishing nets, fishing boats and fish preservation plants.

Iron and steel industries have become key industries since they are basic to many other manufacturing industries. The major centres of these industries are found in the United Kingdom, France, West Germany and the Soviet Union. They are responsible for producing varieties of steel. This in turn is consumed by other industries engaged in manufacturing railway engines and wagons, automobiles, ships and other machines. Coal as a raw material is used in several chemical industries. Aluminium is used in making aeroplanes.

Network of Transport and Communication

One of the essential conditions for the development of industries is the presence of a network of transport and communication. Europe is best served by every modern means of transport.

Study the map of Europe. You will find that the railway lines crisscross Europe, notwithstanding the great mountain barriers.

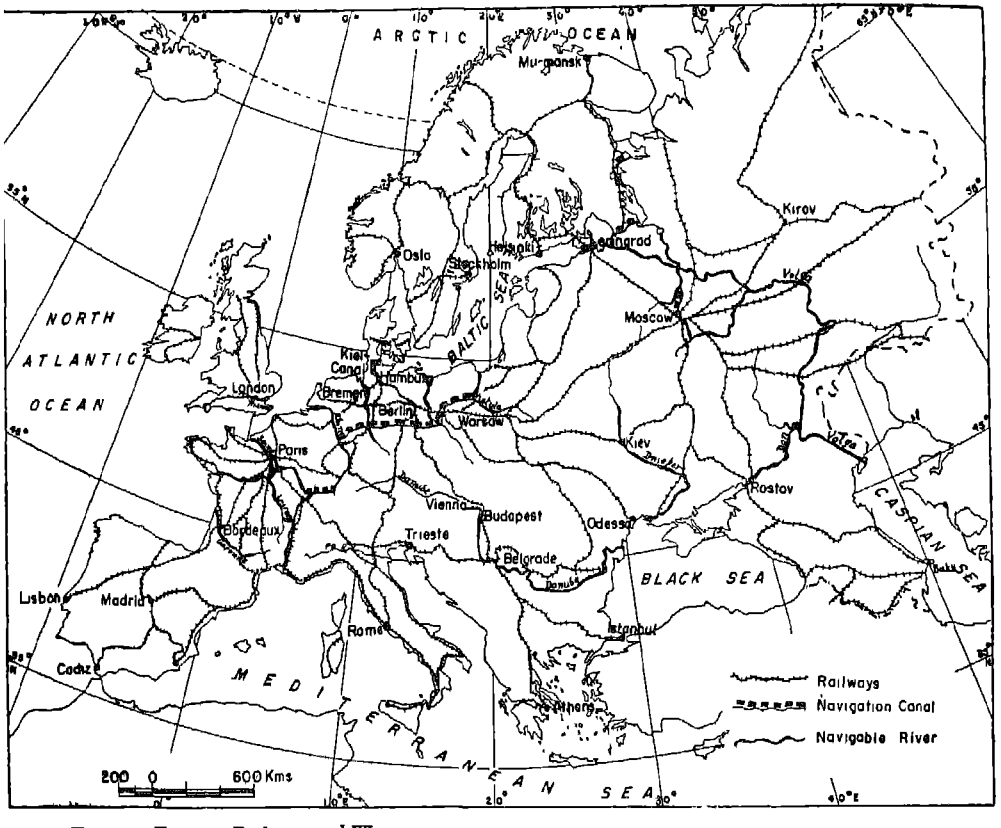


FIG. 11. *Europe—Railways and Waterways*

Note the railway network and inland waterways of Europe. Which parts of Europe are ideally served by both of them?

Which are the major railway junctions of Europe? Compare the positions of London, Paris, Berlin and Moscow. How do they differ from one another? Very often road transport competes with railways. The highways are broad and well-surfaced roads, busy with trucks, buses and cars. People have developed a high sense of road traffic.

The bulky and heavy goods or cargo are generally transported by major inland waterways, since water transport is very cheap. Note the Rhine passing through the industrial heart of Western Europe. It is the busiest inland waterway of Europe. Besides the Rhine, the Seine, Thames and Danube are important waterways. Also note that Moscow is connected by rivers and canals to several seas bordering the Soviet Union. Locate on your map the important sea ports of Europe.

Air transport has also now become very popular in Europe. Airways connect all important cities of Europe with one another The international airports of Paris, London, Berlin, Frankfurt, Geneva, Rome and Moscow are connected with almost all other continents. Large and speedy jet planes now cover distances in hours which once took months.

Population of Europe

Asia has the largest number of people. But it is Europe that has the highest density of population. If its people were to be uniformly distributed all over the continent, there would be 58 persons per square kilometre. If we exclude the Soviet Union from Europe, it possesses only 7 per cent of the world's land area. But it accounts for 19 per cent or nearly a fifth of the world's population.

By and large the Central Plains of Europe are densely populated. Why should it be so? However, the most densely peopled parts of Europe are found around coal-fields and major ports. While the former are essentially industrial centres, the latter are the centres of international trade and commerce.

Study the population map of Europe and note the thickly populated parts lying in England, Belgium, Netherlands, France, Germany, Italy and the Soviet Union. You should be able to explain

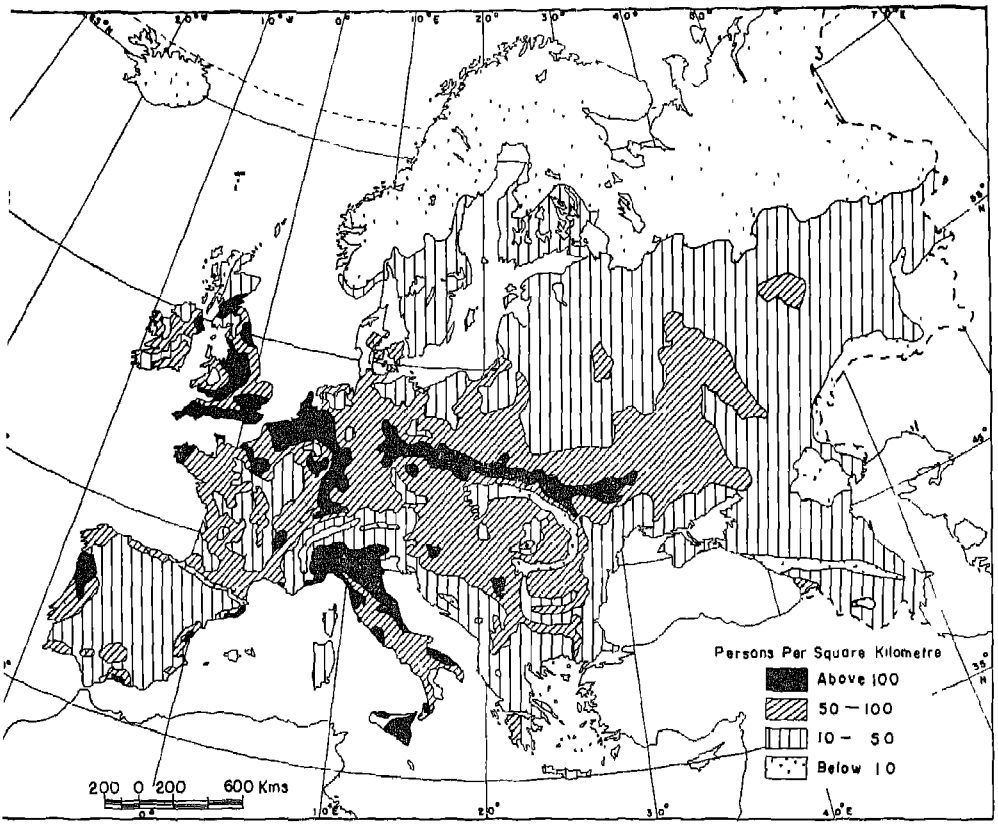


FIG. 12. *Europe—Distribution of Population*

Note the most densely populated areas of Europe. Which ones are very sparsely peopled? Why are they so?

why each of these areas are so thickly populated.

The geography of Europe points out to us how important are the natural resources of a country to its people. But more so are the people themselves who utilise these resources intelligently for national prosperity.

THE NEW TERMS YOU HAVE LEARNT: *Dykes*—Big embankments built in order to protect land from the sea. *Lignite*— A low-grade variety of coal which is brittle and brown in colour. It gives out less heat compared to bituminous coal.

EXERCISES

Review Questions

1. Answer the following questions:
   (i) What is the staple food crop of Europe?
   (ii) Name two cereals that supplement the main food crop of Europe.
   (iii) Which is the busiest inland waterway of Europe?
   (iv) Name the two leading sea fisheries of Europe.
2. Distinguish between:
   (i) Bituminous coal and lignite
   (ii) Extensive and intensive agriculture
3. Make out correct pairs from the two columns:

(i) A farming practice in which only a few farmers till large farms mainly with the help of machines	(a) Intensive farming
(ii) A farming practice in which major emphasis is laid on breeding and rearing of milch cattle.	(b) Extensive farming
(iii) A farming practice involving lot of labour over a small piece of land	(c) Mixed farming
(iv) A farming practice involving combination of cultivation of crops and rearing of animals for their milk and meat on the same farm	(d) Dairy farming
	(e) Plantation agriculture

4. Complete the following statement with the most suitable ending:
   Europe has made great progress because
   (i) it has very large and rich agricultural lands
   (ii) it is favourably situated in relation to other parts of the world
   (iii) its people have made the best possible use of its position and natural resources
   (iv) it has been the 'Cradle of the Western Civilization'

5. Write an essay of about twenty lines on agricultural practices followed in Europe.

Map Work

6. On an outline map of Europe locate and name the following:
   (i) The straits joining (a) the Atlantic Ocean and the Mediterranean Sea; (b) Sea of Marmara and Black Sea.
   (ii) The canal connecting the North Sea and the Baltic Sea.
   (iii) Three important passes in the Alps carrying important railway lines.

Topic for Class Discussion

7. *Farm Practices in Europe*

   Collect information on this topic. Divide the class in a few groups each one collecting information on one aspect of it. Then discuss which practices have any significance for India.

7

Two Big Nations of Western Europe

THE TERMS YOU ALREADY KNOW: *Dairy Farming*—A kind of agriculture in which major emphasis is on breeding and rearing of milch cattle. Hay and other fodder crops are raised mainly to feed cattle. *Rotation of Crops*—Raising of crops in a certain sequence on the same piece of land mainly with a view to restoring the fertility of soil.

IN ancient Europe, the two small countries that mattered most were Greece and Italy. In modern Europe, their place was claimed by France and the United Kingdom. Being located very close to each other in Western Europe they have several things in common. Yet they also differ from each other in many respects. Let us see how and why this be so.

FRANCE

France is only one-sixth the size of India. Still in Europe it is the second largest country, standing next only to the Soviet Union. Glance at the map and you will see that France faces three seas. It is further bounded by two big mountains. Together they have given France a well defined boundary. Locate them on the map.

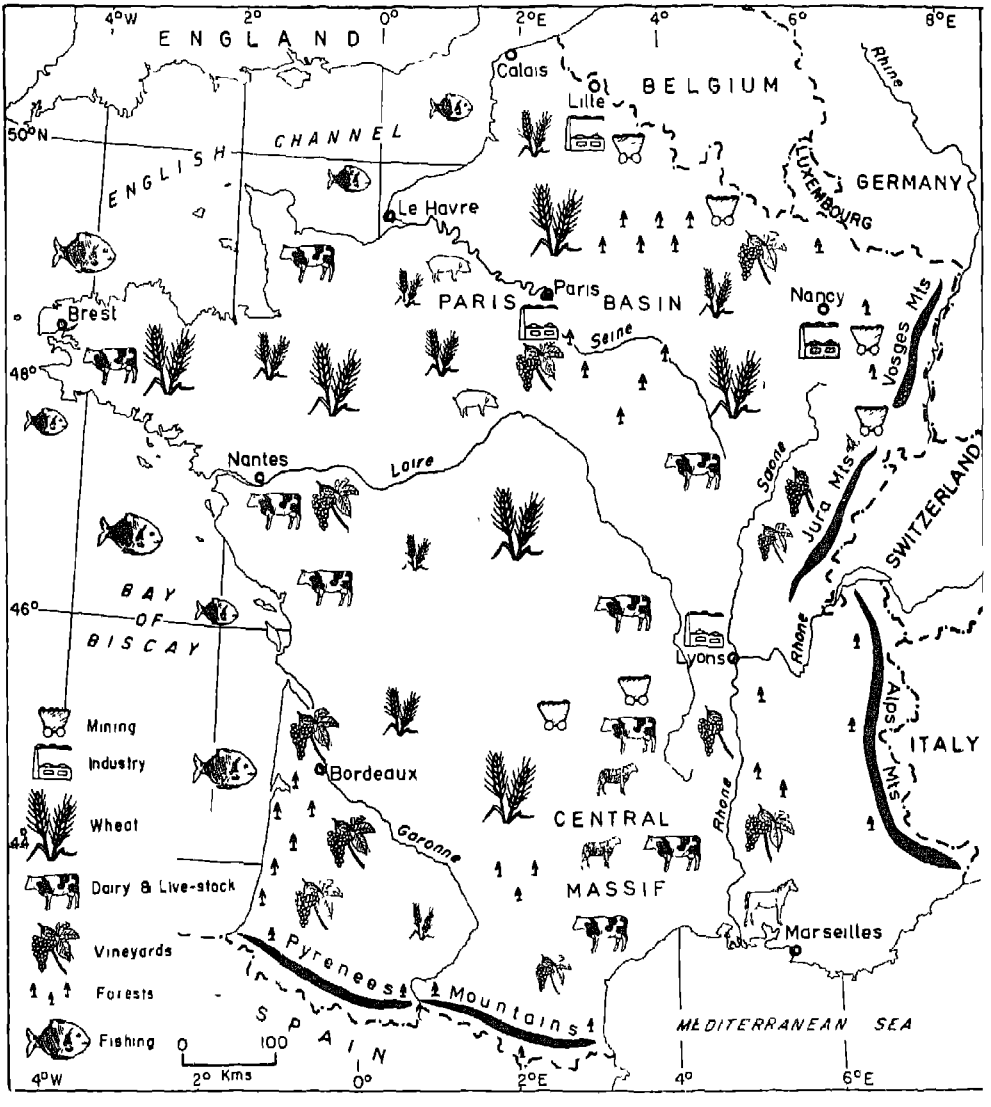


FIG. 13. *France—Relief and Land Use*

Locate the Loire, the Seine and the Rhone rivers. Do you think that Paris is favourably located in France?

Relief and Climate

France has a varied relief. Look at its northwestern coastline which is highly indented. France has narrow coastal plains and fertile river valleys like those of the Seine and the Loire. It possesses low hills such as those in Brittany. The Central Massif of France is a wide plateau made up of very old rocks. On its borders are situated the young fold mountains, namely the Alps and the Pyrenees. The loftiest peak of the Alps lies in France. Can you recall its name and height?

VII. A French Village in the Pyrenees

This village in southern France is known for winter sports Do you see the snow-fields in the background?

France is a 'Small Europe' in many ways. This is so not only in regard to its relief but more so with regard to its climate. While the western and northern parts of the country enjoy the oceanic type of climate, eastern France reminds us of the continental type of climate. Southern France experiences typical Mediterranean type of climate. Given below are the data of temperature and rainfall for three different places in France, namely Lyons, Bordeaux and Marseilles. If you study them carefully you will be able to match and label them correctly.

		J	F	M	A	M	Jn	Jy	A	S	O	N	D
Town A	T.°C	6.1	7.2	9.4	12.8	16.1	20.0	22.2	21.7	18.9	14.4	10 0	6.7
	Rf. mm.	48.3	35.6	40.6	43.2	48.3	25.4	15.2	22.9	61.0	101.6	78.7	50 8
B	T.°C.	5.0	6.1	8.3	11.7	14.4	17.8	20.0	20.0	17.8	12.8	8.3	5.0
	Rf. mm.	61.0	50.8	55.9	63 5	66.0	71.1	45.7	48.3	66.0	83.8	76.2	63.5
C	T.°C	1.7	3.9	6 7	11.1	14.4	17.8	20.0	19.4	16.1	11.1	5.6	1.7
	Rf. mm.	35 6	38.1	48.3	61.0	81.3	83.8	73.7	78.7	76.2	96.5	66.0	43.2

Land Use and Economic Development

The indented coastline of France has given it numerous natural harbours. They provide good opportunities for fishing, shipping and overseas trade.

Narrow coastal plains and fertile river valleys have been turned into rich agricultural farmland. Nearly two-fifths of the total area of France is under cultivation. Wheat is by far the most important crop of France. It also produces barley, oats and sugarbeet. French farmers generally follow mixed farming and rear cattle, pigs and poultry on their farms. The animals are fed on hay, fodder and tops of sugar-beet. The animal products fetch good returns to the farmer.

France is a land of intensive agriculture. Every bit of land is used. Manures and fertilizers are applied. Rotation of crops is followed. All these help to maintain fertility of the soil. As a result the yields of crops in France are very high. It is the only West European country which is self-sufficient in food grains.

Valley slopes are generally devoted to cultivation of grapes. The fields where grapes are cultivated are known as vineyards. Most of the grapes are used in making wines. French wines are known for their quality. The most notable among them is Champagne.

VIII. Harvesting Grapes in France

The two ladies are busy in cleaning and grading grapes to be used in the preparation of the Champagne—the most famous French wine. Look at the hoods worn by the women. What kind of a climate does it indicate?

It is made from grapes grown in the district of Champagne not far from Paris. France also produces other Mediterranean fruits like olives, figs, peaches, plums, pears and oranges.

The low hills and plateaus of France make it possible to leave about one-fourth of its total area under meadows and pastures. These pasture lands well-fed with rain showers are used for rearing animals for their milk as well as meat. As a result it is a leading producer of milk, butter, and cheese in the whole of Europe, excluding the Soviet Union. France also has a large number of sheep, yielding fine wool.

Fortunately, France has preserved nearly a fifth of its land under forests. Besides its forest wealth, the mountainous part of France possesses some of the turbulent rivers. These rivers well-fed with snow and rainwater tumble down the high mountains and plateaus. They provide France with abundant water-power at a low cost. Down below on the plains they are used for inland water transport.

France is equally well endowed with underground wealth. Very rich are its iron-ore deposits. Coal is also available in some parts. Iron-ore, coal and water-power provide the necessary base for its iron and steel industry. France exports iron-ore and imports coal from the neighbouring countries of Germany and Belgium.

France is well-known for its iron and steel industry. It specialises in building machines. It produces motor cars, trucks, railway equipment, ships and aeroplanes. It has also a large textile industry. It manufactures chemicals, fertilizers, electric and electronic goods and perfumes.

France has an integrated network of transport. It possesses well-kept highways and efficient railways. Well-knit inland waterways have proved an asset to its heavy industries. It now boasts of its modern air services. Paris is the centre of every kind of transport. It is rightly called the heart of France. This well-planned city of France unfolds its story spread over several centuries. It

gives us an idea of the achievements of France in arts, literature, learning, science and technology. It has been the leading fashion centre of the world.

The total population of France is about 50 million people, which is even less than that of Bihar. It gives it an average density of nearly 90 persons per square kilometre. A little more than half of its population is concentrated in big towns and cities.

UNITED KINGDOM

The United Kingdom is yet another small country of Western Europe. It is hardly one-thirteenth the size of India. But it too has been a big European nation. You will notice some similarities between this country and France. More striking perhaps may be the differences between the two.

Unlike France the country is situated off the mainland. This country occupying a major portion of the British Isles is surrounded by the sea. It is, therefore, *insular* in location.

The English Channel which separates this country from the continent is hardly 30 kilometres at its narrowest. However, it had been found too wide to overcome for any invader. The country did wisely utilize this advantage to increase its wealth and prosperity.

While France is a compact and a homogeneous country, the United Kingdom is spread over two islands. The major part of the country consists of the Great Britain island. It includes three units: England, Scotland and Wales. The remaining part of the country namely Northern Ireland lies on the other island. Now you will realise why this country is called the United Kingdom.

Relief and Climate

Unlike France, the United Kingdom is a country of low relief. It is marked with undulating lands, rolling hills, dissected plateaus

and small rivers. The highest peak is only about thirteen hundred fifty metres above sea level. Arms of the sea penetrate deep into these islands. As a result the country has an indented coastline, and no part of the land is more than 125 kilometres from the sea.

The climate of the United Kingdom is typically oceanic. It is temperate and equable with a narrow range between summer and winter temperatures. The westerlies tend to make its winters warm and summers cool. The winter months are slightly more rainy than the others. The clouds and fogs restrict the sunshine, on an average, to less than two hours a day. The cyclones or depressions often cross the island and are followed by fair weather. It is thus a land of variable weather.

Land Use and Economic Development

As there are no mountains worth the name in these islands it has very little land left under forests. Neither the forests nor the farmlands dominate the landscape of the United Kingdom. The dominant position is claimed by the meadows and the natural pastures. As a result sheep and cattle rearing have become very important agricultural activities. Mild and moist climate has been found suitable for these activities. The United Kingdom has become famous for its milch cattle. On an average, a milch cow yields more than 3,000 kilogrammes of milk every year. The country exports its milch cows on a large scale.

The country has less than a third of its total land devoted to farming. The major farmlands of the United Kingdom are to be found in east and south-east England. Not much of this land is fertile. Only 5 per cent of its people are engaged in farming. Yet with the help of modern tools and techniques they produce food enough for fifty per cent of its population. Barley, wheat, rye, oats, vegetables and fruits are the major crops. Even on these farms cattle

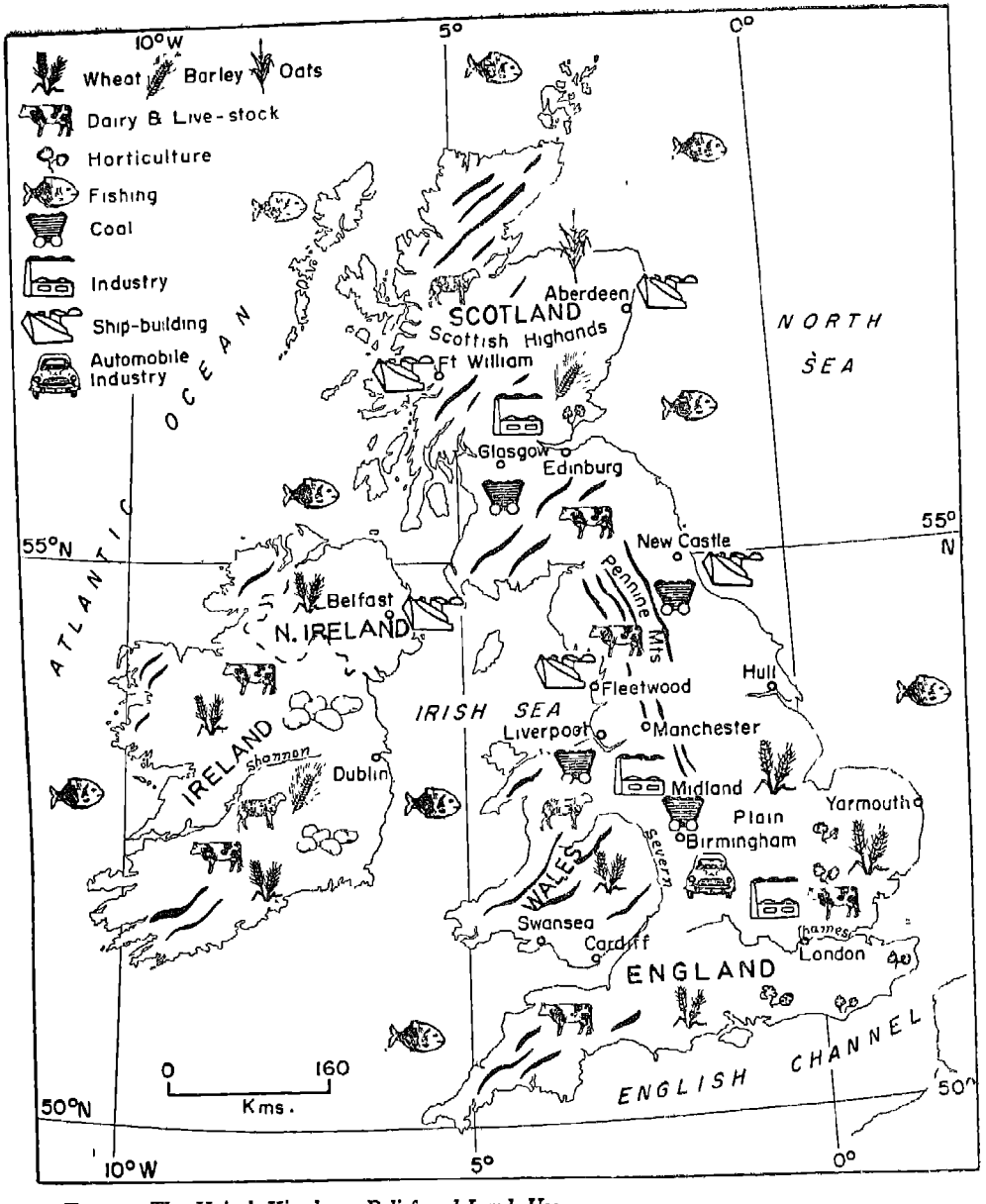


FIG. 14. *The United Kingdom—Relief and Land Use*

Note as many things as you can to suggest that the sea has a powerful influence on the lives of the people in the United Kingdom.

and pigs are reared for their milk and pork. Poultry farming is very common. Now more and more machines and tractors are being used on English farms.

IX. A Special Breed of a Cow in England

This South Devon cow has been developed both for its milk as well as beef. Besides its high yield of milk it puts on weight very quickly. Do you know that on an average an English cow yields more than 3,000 litres of milk each year?

The shortage of food supplies is made up by fishing. The country is surrounded by the seas that abound in fish. The long indented coastline has provided numerous natural fishing harbours. The most important fishing ground is the Dogger Bank. The country has a large mechanized fishing fleet. It has facilities to preserve fish both on the fishing craft and at the fishing ports.

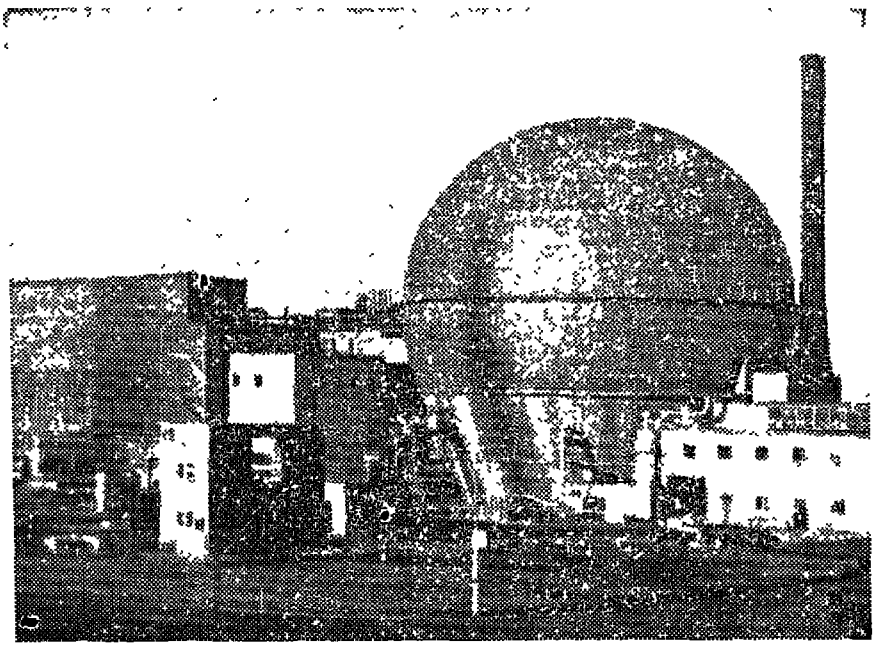
The fishing fleet consists of trawlers and drifters. While the

former are used for catching fish lying near the sea bed, the latter are used for those which swim in shallow waters, or near the sea surface. The nets used are also of different types. In the former case they are like bags, while in the latter case they hang like straight walls close to the surface of the sea. The nets are several hundred metres long. The important fish found in deep waters are halibut, plaice and sole. In the shallow waters the common varieties consist of herring, mackerel and cod. The total fish catch of this small country is as high as that of our country. No wonder then if fish becomes an important item of food in the United Kingdom.

These fisheries have been a training ground for the British sailors. The daring seamen and the overseas traders of the United Kingdom have found this big world quite a small place for them. Do you know how?

Perhaps the greatest natural resource of the United Kingdom has been coal. It was the first country to use this "black gold" on a very large scale. This helped the country to place itself on the industrial map of the world. Even today it produces nearly 200 million tonnes of coal, standing fourth in the world. The country has not much of water-power. In order to supplement its power resources, it now produces atomic energy. The country was equally rich in its iron-ore deposits. For several decades it led the world in the production of pig-iron and crude steel as well. Its iron-ore deposits are now almost exhausted. Nonetheless, it has a flourishing iron and steel industry based mainly on imported iron-ore.

One of the most important contributions of the United Kingdom is the Watt's steam engine. The widespread use of steam and mechanical power led to the birth of the *Industrial Revolution* in this country. As a result of this revolution, the production of goods which had been confined to houses or cottages gradually shifted to spacious factories



X. A New Atomic Power Station in Britain

The big dome houses a reactor and a turbine plant. Why does the United Kingdom prefer to produce electricity from atomic fuel?

specially built for the purpose. This also led to the division of labour in which each one follows a specific job.

Britain produces large quantities of iron and steel. It builds ships and manufactures railway engines, wagons, motor cars and aeroplanes. It has a very big textile industry which grew in the wake of the Industrial Revolution. It manufactures cotton and woollen textiles. It has to import raw materials like cotton and wool from other countries. Look at the map and locate the centres of various industries. They are located either near the coal-fields or near the sea ports. Why should it be so ?

For industries a good network of transport is a must. The United Kingdom has a fine network of roads and railways. Many of its industries and commercial centres are located on the coasts. They are well served by the seaways.

London is the biggest city of the country. For a long time it had been the largest city of the world. It is situated on the Thames which is navigable by ocean-going ships.

This small country has a very big population. With nearly 55 million people, the average density of population is much higher than that of our country. There are about 225 persons per square kilometre as against about 182 in our country. Four persons out of every five live in cities and towns. This shows how highly industrialized this country is. These industries naturally depend upon trade with other countries. It imports food grains, a variety of raw materials for its industry and petroleum for its motor cars. It exports manufactured goods. But for such a trade, the British people would have been poorer than what they are today.

THE NEW TERMS YOU HAVE LEARNT: *Insular*—Surrounded by seas on all sides. *Industrial Revolution*—A marked change in manufacturing from hand operated tools to power driven machinery. It came about in England in the middle of the eighteenth century.

EXERCISES

Review Questions

1. Answer the following questions:
   (i) Name three different types of climates found in France.
   (ii) Mention three important features of the oceanic climate.
   (iii) By what name is the central plateau of France known?

2. Distinguish between:
   (i) the British Isles and the United Kingdom
   (ii) a trawler and a drifter

3. Give reasons for the following:
   (i) Britain looks more to the sea than to the land for its prosperity
   (ii) While France has been mainly a land power, the United Kingdom has become a sea power.
   (iii) Whereas France exports iron-ore, the United Kingdom has to import it
   (iv) The United Kingdom was the first to set up an atomic power plant.

4. Give a brief account of the natural resources of France and show how they are being properly used.
5. What is Industrial Revolution? How did it come about in the United Kingdom?

Practical Work

6 Study carefully temperature and rainfall figures of Marseilles and Bordeaux. Show them graphically and describe the climates of the two places with respect to (i) the total amount of rainfall; (ii) the range of temperature; (iii) the rainiest and the driest periods; and (iv) any other thing that strikes you most.

Topic for Class Discussion

7. *France and the United Kingdom*

Collect information about these countries and prepare a two column chart to show the similarities and differences between the two. Besides geography you may like to know more about their history, religion, political institutions, culture, languages, etc.

8

Countries of Northern, Central and Southern Europe

THE TERMS YOU ALREADY KNOW: *A Rift Valley*—A long and steep-sided valley along the crack or a rift developed in the land. *Sericulture*—Rearing of silk worms and producing raw silk as a cash crop for supplementing farm incomes.

LOOK at the map of Europe and study the location of Norway, Germany and Italy. Norway is a Scandinavian country, belonging to northern Europe. Germany is a central European country. Italy forms part of the southern or Mediterranean Europe. You will see how distinct is the individuality of each one of them.

NORWAY

Norway is a mountainous country facing the Atlantic. The mountains raise their heads and shoulders, as it were, from the deeps of the sea. It is very difficult to say whether the long and narrow arms of the sea penetrate deep into the land, or the mountain ranges fan out into sea. Any way, Norway is known for its highly indented

and rugged coastline. These narrow and long inlets of the sea bounded by cliffs are known as *fiords*. They are nothing but long and deep U-shaped valleys that are partly submerged under the sea.

Relief and Climate

The mountains of Norway are high and rugged. The mountain peaks are always covered with snow. High mountain valleys are occupied by permanent glaciers. The land is generally rocky. Soils are found only in patches; and are stony and infertile.

For its high latitudes, Norway has an exceptionally mild climate. This astonishing warmth is due to the moderating influence of the sea, especially the warm North Atlantic Drift. It keeps all its ports free from ice all through the year. The westerlies cause heavy precipitation all along its western coast.

Land Use and Economic Development

The forests consisting of coniferous trees are found in a few sheltered valleys, mostly in the eastern part of the country. Land under pastures or meadows is almost insignificant.

Not more than 5 per cent of the land can actually be tilled or be devoted to pastures. On this limited land the Norwegians engage themselves in dairying and farming. They cultivate barley, oats, potatoes and hay for their animals. The farmers supplement their income by taking to either fishing or lumbering.

The Norwegians find the sea more hospitable than their land. The deep calm waters of fiords provide ample opportunities for coastal fishing. But far from being satisfied, the brave fishermen prefer to face stormy seas for fishing and whaling. They employ the most modern means and techniques to haul big catches from the far off seas. A large number of people are employed in drying, salting and canning fish and extracting cod-liver oil.

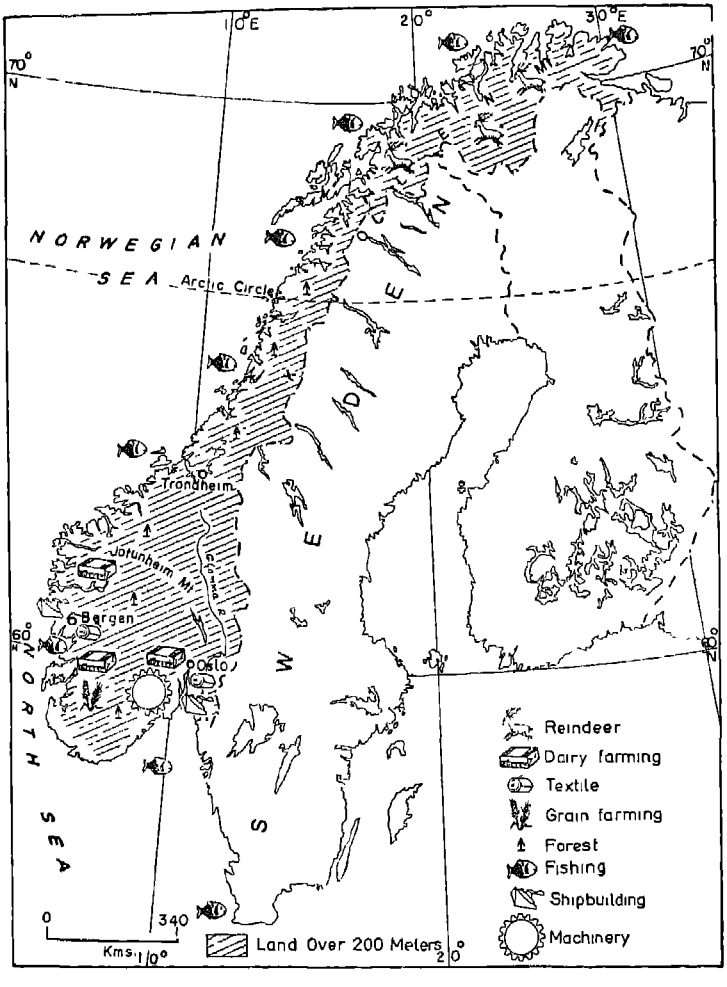


FIG. 15. *Norway—Relief and Land Use*

Note the highly indented nature of the coast. If it is stretched out, it would be long enough to cover half the length of the equator. How much of this country lies within the Arctic Circle?

Whaling is a very specialized and complicated operation, in which Norwegians have a great stake. They reach out to the cold and stormy waters of the Arctic as well as the Antarctic Seas. The whale is a huge mammal, the largest that now exists on the earth. They are hunted for their meat and blubber or fat. Very big ships on the sea work as central floating factories. They cut and process

whales and pack a variety of finished products. Small ships do the actual job of locating and hunting fish with great accuracy. Even computers are now used for locating whales.

This efficiency of the whalers has proved too unkind to the whales! Their number is fast dwindling. Now the whaling nations have entered into a voluntary agreement to kill only a fixed number of whales every year. They also undertake periodic census to find out the population of whales. In this way the whales can be saved from total extinction. Above all, this alone will also allow the industry to continue indefinitely.

Shipping is yet another means of living provided by the sea to the Norwegians. The country earns a good deal of foreign exchange through its large merchant fleet.

Now Norway has developed manufacturing industries as well. It manufactures pulp, paper, newsprint and iron and steel. For this it uses three of its very useful natural resources, namely iron-ore, timber and water. Its turbulent rivers while tumbling down the hills provide ample water-power. A Norwegian consumes water-power much more than any one else.

The total population of Norway is less than that of the city of Delhi. This is so when its size is no less than that of the Maharashtra State. Thus its population is very sparse. The sea serves as a 'coastal road.' Why should it be so? Oslo is the capital of Norway.

You will also like to know why this country is called the "land of the midnight sun." Since nearly a third of its total area lies within the Arctic Circle, it is but natural that the days as well as nights should be very very long over there. In some parts they are as long as two months. Can you imagine what it would be like during such long days or equally long nights?

GERMANY

Unlike Norway, Germany is a land of plains, low plateaus and uplands. Because of its central position almost every transcontinental route passes through it. This country, facing the North and Baltic Seas, shares its land frontiers with as many as nine countries. This has been an asset for this country for developing international trade. Can you also think of any disadvantages arising out of such a situation?

Even to this date it is a nation that has been split up into two as a result of World War II. Notwithstanding such military defeats, today it is the foremost European country in industries, international trade and general prosperity. Let us see what it is due to.

Relief and Climate

The northern half of Germany consists of lowlands covered with sand, gravel, pebbles and pieces of rock. They are the deposits left behind by the old ice sheets on their retreat. What are they called ? The central zone of the country consists of low worn-down mountains. It is highly dissected by rivers flowing through them. On the west is a broad rift valley occupied by the Rhine. The Black Forest is a low tableland. To its south lie the Bavarian Alps, separating the country from Switzerland and Austria.

The Rhine, Elbe, Weser and Danube are the important rivers of Germany.

The coastal lowlands enjoy a marine type of climate. As one proceeds southwards or eastwards the range of temperature tends to increase. In the south the winters become severe owing to the rise in altitude. Rainfall is also relatively heavy in these parts.

West Germany

The country is now divided into two sovereign republics. One is the Federal Republic of Germany or popularly known as West

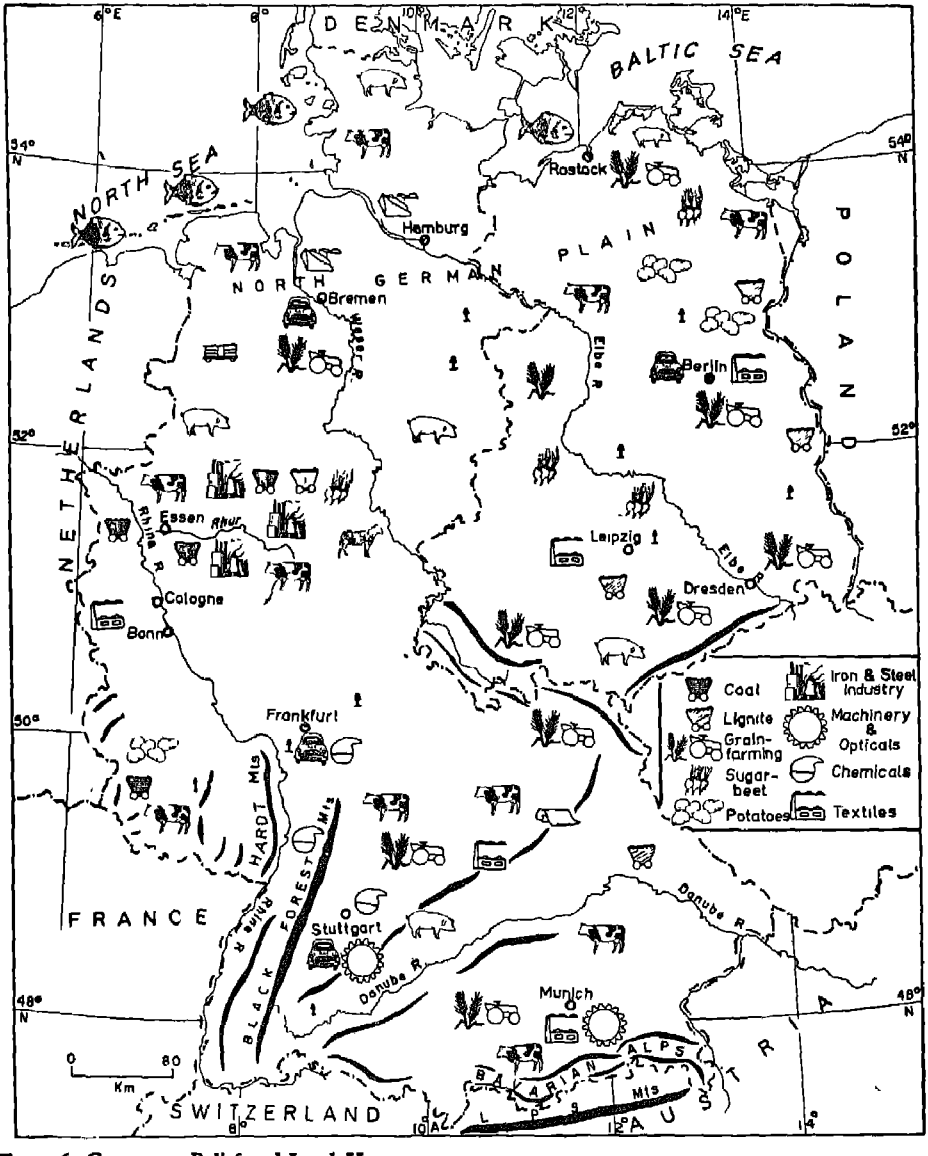


FIG. 16. *Germany—Relief and Land Use*

Note the size of the two German Republics. What makes the Rhine so important for

Germany. The other is German Democratic Republic, commonly known as East Germany. Politically, West Germany is a West European country having a democratic form of government. East Germany is a socialist country belonging to Eastern Europe.

Land Use and Economic Development

Nearly a third of the total land is under crops and about one-fourth is left under pastures. Fertilizers and manures are used to raise good crops of wheat, barley, rye, oats, potatoes, sugar-beet and hay depending upon soil and climatic conditions. Land is intensively cultivated employing every modern means. Mixed farming is commonly practised. In Europe, this country is an important producer of milk, butter, cheese, meat and poultry products.

About a third of its land is under forests. They are confined to southern uplands and the Bavarian Alps. Besides lumbering, these well-cared-for forests provide a base for manufacturing wood-pulp, paper and newsprint.

Perhaps the greatest resource of the country is its coal and lignite. The Ruhr is the largest coal-field of Europe. The Saar is yet another important coal-field of West Germany.

The Ruhr is often called the heart of industrial Europe. It is studded with heaps of coal at the pit-heads, coke furnaces, foundries, iron and steel plants, steel rolling mills, chemical plants and textile factories. Essen is the iron and steel centre of the country. These industries are well served by a dense network of railways and inland waterways. The Rhine has become the life-line of this industrial nation. Also locate on the map the Kiel Canal connecting the North Sea with the Baltic Sea.

West Germany is also known for its automobile industry. It now stands next only to the United States in the production of auto-

XI The Central Part of West Berlin

Look at the new multi-storeyed buildings of the busy business square. The church in the background reminds us of the ravages of World War II. Do you notice an orderly traffic in the picture?

mobiles—motor cars and trucks. It is also reputed for its chemical industry.

In area the country is a little smaller than Andhra Pradesh but has a population equal to that of Bihar. The average density of population is 232 persons per square kilometre. Bonn is the capital of West Germany. The other important cities of the country are Hamburg, Bremen, Munich, Cologne, and Frankfurt on the Main.

East Germany

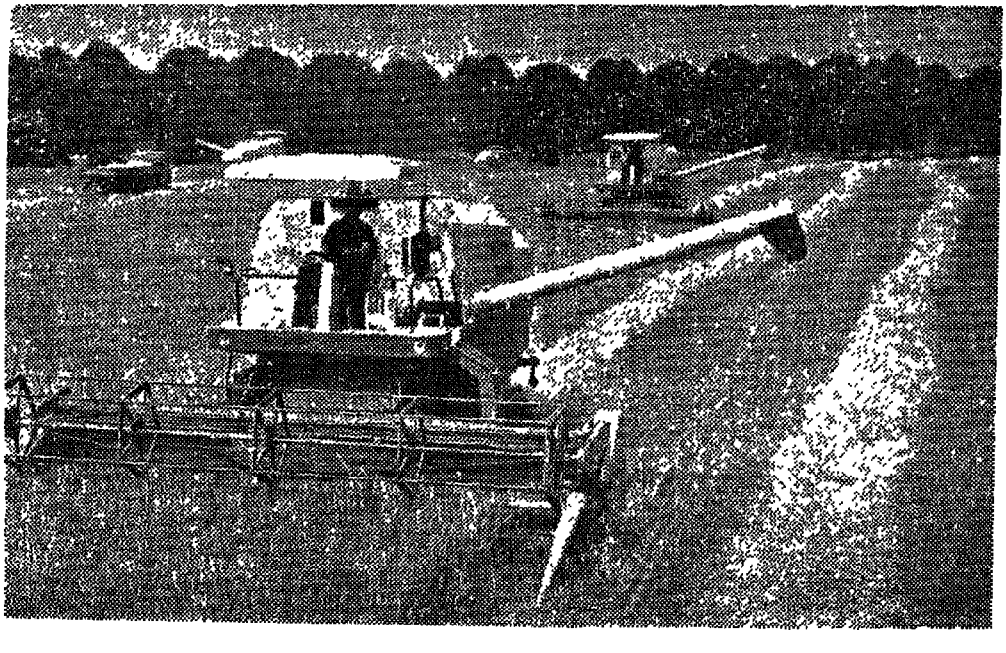
This country has an area slightly less than one-third of West Germany. With a total population of 16 million people it has the average density of nearly 150 persons per square kilometre.

Nearly three-fifths of its land is under crops and permanent pastures. It produces rye, wheat, barley, oats, beet and potatoes. Animal husbandary including dairying is an important agricultural activity. About a fourth of its total area is wisely left under forests where systematic afforestation is in progress.

Lignite is by far the most important resource of this country. It is used for producing thermal electricity. Potash is yet another mineral resource. Coal, lignite and potash also serve as raw materials for its chemical and fertilizer industries. The country has lately

XII. Harvesting Wheat in East Germany

Look at the harvestors at work. They not only harvest the crop but also thrash the corn on the spot. Do you see a truck collecting wheat in the background ?



developed iron and steel industry. It is also known for its plastic, textile and optical industries.

The capital of this country is East Berlin. Leipzig is another important ancient city. Berlin, the capital of undivided Germany, has been the largest German city. Now it is divided into two parts—West Berlin and East Berlin. West Berlin although situated in East Germany belongs to the Federal Republic of Germany. An artificial wall now divides the inhabitants of Berlin city into two States following two different systems of political and economic life.

ITALY

Italy, an ancient European nation, is a land of contrasts. Situated at the head of the Mediterranean Sea, this small country is comparable to India in several respects.

Relief and Climate

Like India this country too has three major physical divisions. In the north it is bounded by a lofty mountain wall of the Alps. South of it lies the Plain of Lombardy. It has been built by the river Po and its tributaries with the silt and mud brought down from the northern mountains. The river Po is still busy, extending its delta against the Adriatic Sea. Further south lies the Italian peninsula. The old and worn-out Apennine Mountains form the backbone of this rocky peninsula, jutting out into the Mediterranean Sea. Mount Vesuvius is an active volcano in peninsular Italy. The island of Sicily is a continuation of the southern peninsula. It also has a volcanic mountain in Mount Etna. Sardinia is yet another big and hilly island that belongs to Italy.

Italy is a land of contrasts even in respect of its climates. Northern Italy has a continental type of climate. Rainfall occurs all through the year, though it may be slightly higher during spring and autumn. Peninsular Italy has a typical Mediterranean climate.

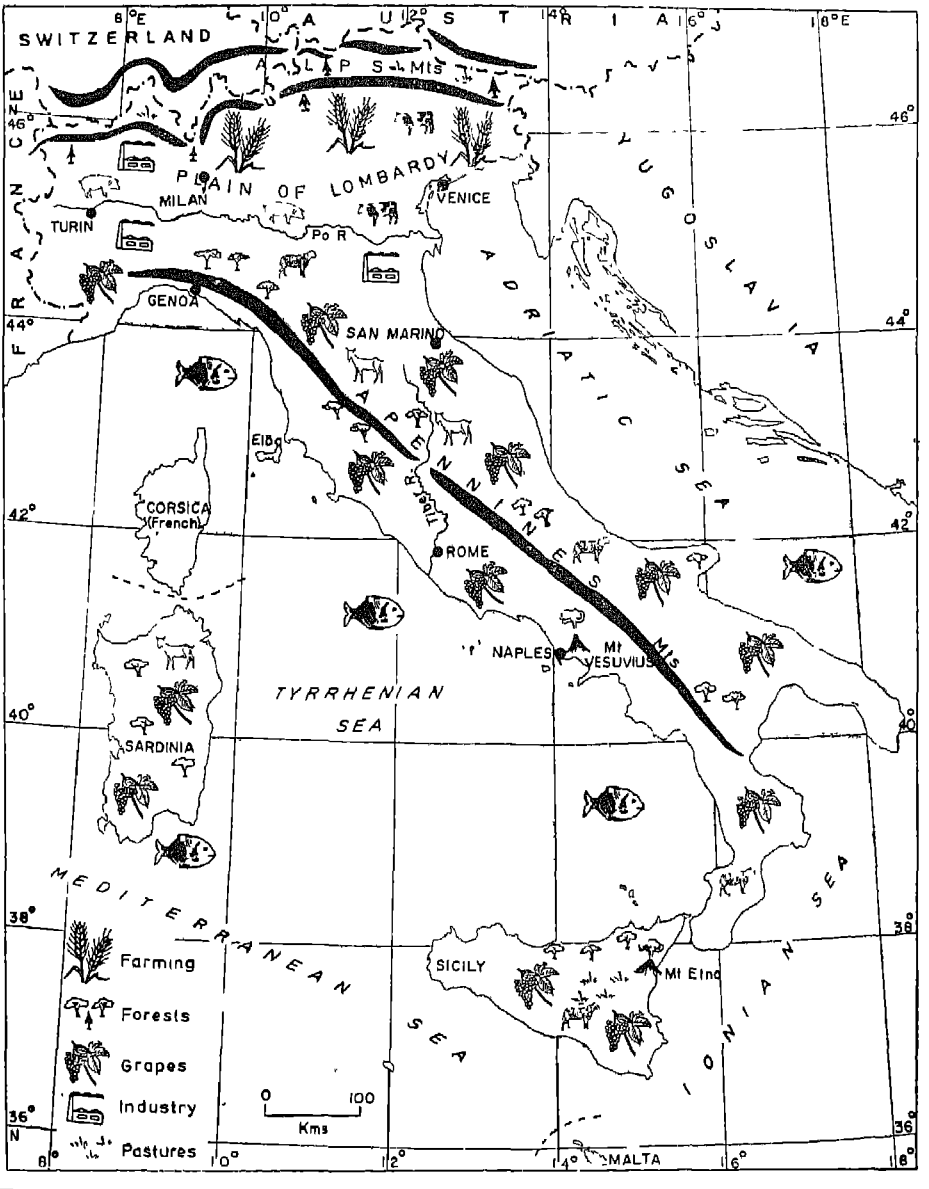


FIG. 17. *Italy—Relief and Land Use*

Note the physical divisions of Italy, and the way its resources are used. In what way is the relief of Italy similar to that of India?

Land Use and Economic Development

In Italy only a fifth of its land consists of plains. Yet it has brought nearly half of its total land under cultivation. Even the hill-sides are intensively cultivated where terraced farms reach up to the hill tops. Wheat and maize are the major crops of northern Italy. Mixed farming is also practised by farmers to supplement their incomes. So is sericulture. Silk worms are reared on mulberry leaves. Orchards and barley farms are common in the south. Italy also produces rice, tobacco and flax. The country has to grow cereal crops as it is heavily populated. Fishing is important in coastal areas to supplement the country's food requirements.

About a sixth of the land is left under pastures. Rearing of sheep, goats and cattle is the main activity in the hilly tracts of the Apennines. Figs, olives and grapes are the important orchards grown on the hill slopes.

In spite of the Alps, Italy has not enough forests; and has to import timber. But its mountains have provided swift perennial rivers. This advantage is fully utilized; and now two-thirds of its electrical energy is derived from water. This is highly important since the country is poor in coal and has no reserves of mineral oil or natural gas.

Its mineral wealth consists of mercury, sulphur, lead, zinc and bauxite. On the whole, its mineral resources are scanty.

The country has a large number of industries. They include iron and steel, chemicals, synthetic fibres and paper. It has a well-developed automobile industry and also builds ships. The Fiat is a famous Italian car. Textile, olive-oil and tobacco industries depend upon agricultural raw materials.

Italy has a population as large as that of Bihar. The northern plain, being very fertile, has the greatest pressure of population on

land. In the south small coastal plains are thickly populated. The average density of population in Italy is about 172 persons per square kilometre. Rome is the capital of Italy. It reminds us of the past achievements of the Roman Empire. Vatican City, a part of Rome, is the seat of the Pope, the head of the Roman Catholic Church. It is an independent 'city state' under his control. Milan, Turin, Genoa and Venice are the important cities of northern Italy. Florence and Naples are among the ancient cities of southern Italy.

The country is well served with a network of railways. It is equally well connected with the rest of the continent through railway routes, some of which pass through the mountain passes like the Simplon, St. Gotthard, St. Bernard and Brenner.

THE NEW TERMS YOU HAVE LEARNT: *Fiords*—Long but narrow and deep U-shaped valleys that are now partly submerged under the sea. *Whaling*—Hunting of whales, followed by processing and packing various whale products on a big ship called whaler.

EXERCISES

Review Questions

1. Answer the following questions:
   (i) What are the two major occupations in Norway?
   (ii) Name three exports of Norway.
   (iii) What are the two important rivers of Germany?
   (iv) Name the four important mountain passes in the Alps.

2. Give a brief account of how the Norwegians have utilized their environment to their advantage.

3. What geographical factors have made Germany the leading industrial country of Europe?
4. In what way Italy has several things in common with India?
5. Complete the table by putting the following items in appropriate columns:
   (a) (i) Delta; (ii) Fiord; (iii) Rift valley
   (b) (i) A land of midnight sun; (ii) A battle ground of Europe; (iii) India in Europe
   (c) (i) Marine and continental climate; (ii) Marine and mountain type of climate; (iii) Continental and Mediterranean type of climate
   (d) (i) Industry and commerce; (ii) Agriculture and industry; (iii) Shipping and fishing
   (e) (i) Mercury and sulphur; (ii) Coal and lignite; (iii) Fish and cod-liver oil.

	Norway	Germany	Italy
(a)			
(b)			
(c)			
(d)			
(e)			

Do you think that each of these countries has a personality of its own?

Making Models

6. Prepare clay models of the following:
   (a) A U-shaped valley and a fiord.
   (b) A rift valley and a block mountain.
   (c) A mountain pass and a volcanic crater.
   (d) An estuary and a delta.

   Compare and contrast these to define each of these terms carefully.

Topic for Class Discussion

7. *How Man Adopts his Environment*

   Hold a class discussion dividing your class into three groups, one each for Norway, Germany and Italy. Let each tell others how it makes use of its environment and of the gifts provided by nature. Record the conclusions you will arrive at in the end.

9

A Big Country of Two Continents

THE TERMS YOU ALREADY KNOW: *Growing Season*—A part of the year which is free from frost and has temperatures high enough to allow the growth of crops. *Time Zone*—A longitudinal division of 15° each within which the local time of a central meridian serves as the standard time for the whole area.

THE Union of Soviet Socialist Republics is commonly known as the Soviet Union. It extends across both Europe and Asia. The low Ural Mountains, the Ural river and the Caspian sea divide this country into two continental wings of Europe and Asia. But this conventional line of demarcation is far from being a barrier between the two continental wings. The Soviet Union is the biggest country in the world. It is as many as seven times the size of India. Since the Russian Revolution of 1917, the country has made tremendous progress in agriculture, industry, science and technology.

The Soviet Union is situated between latitudes of 35° N and 82° N. You will be surprised to know that it extends over 8,800 kilometres in an east-west direction. Because of this, the Soviet Union extends across eleven time zones.

Find from the map the names of oceans and seas which border the Soviet Union in the north, north-west, south-west, and east. Which countries in Europe and Asia make common frontiers with the Soviet Union? Look at its southern border. You will find that a very narrow strip of land separates it from the northern border of India.

Physical Features

But for its mountainous fringes nearly the whole of its area is either flat, or consists of low plateaus or uplands.

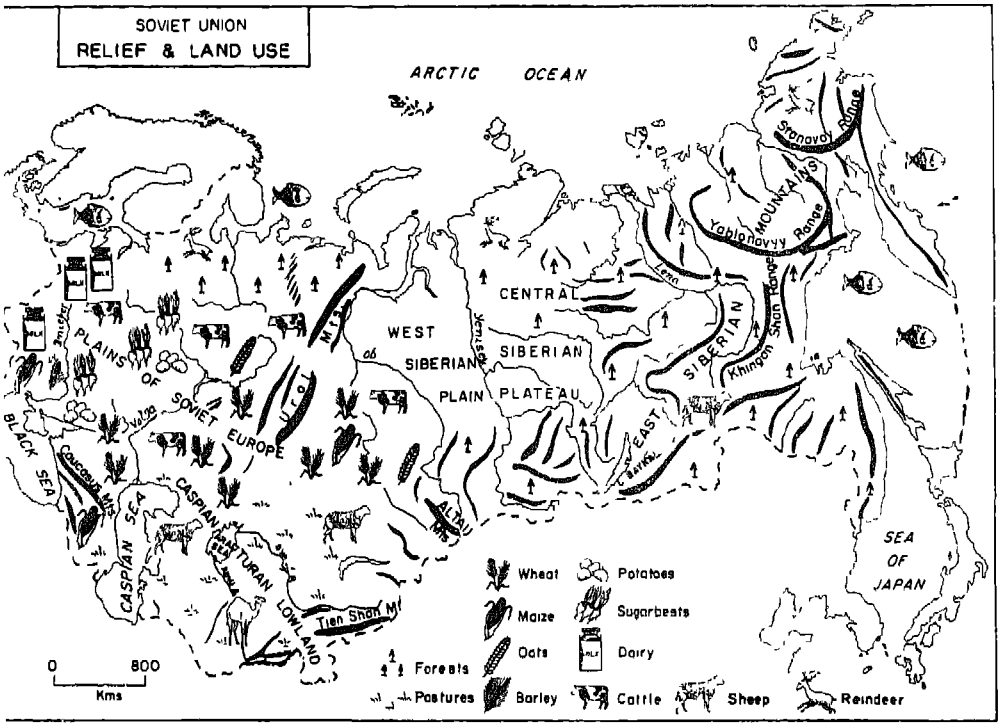


FIG. 18. *The Soviet Union—Relief and Land Use*

Note the physical features and important rivers. In what directions does the land slope?

There are five chief physical divisions of the Soviet Union. They are : the Plains of Soviet Europe; the West Siberian Plain; the Caspian-Turan Lowlands; the Central Siberian Plateau and the Mountainous Region along its southern and eastern borders.

The Plains of the Soviet Europe. This is one of the most extensive plains in the world. It stretches from the Arctic Ocean in the north to the Black Sea and the Caspian Sea in the south. It is a continuation of the Central European Plain.

These low-lying rolling plains are drained by several rivers. Find out their names from the map. Of these the Volga is the most important. It drains into a land-locked sea called Caspian. These plains being very fertile form the heartland of the Soviet Union.

The West Siberian Plain: These plains are situated between the Urals on the west and the river Yenisey in the east. These marshy lands slope very gently towards the Arctic in the north. They are drained by the river Ob.

The Caspian-Turan Lowlands: This is an extremely low-lying region. It consists of the flat lowlands around the Caspian and the Aral Sea. The Caspian lowland is a flat plain occupying the dried bed of the Caspian which was once far bigger than what it is now. The Turan lowlands are drained by the rivers Syr Darya and Amu Darya. These lowlands include the hot deserts of Kazakhistan.

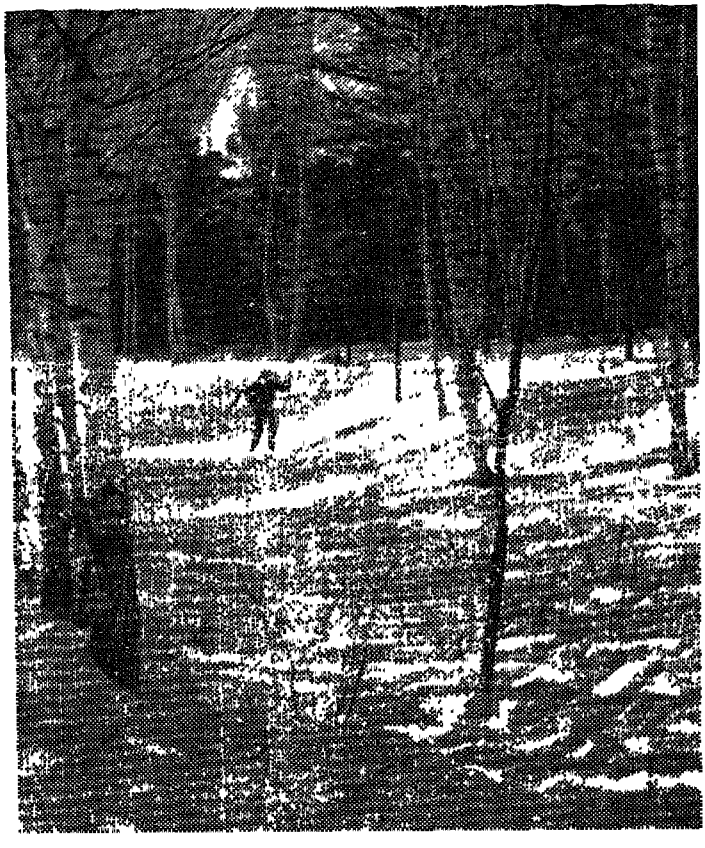
The Central Siberian Plateau: This is a low plateau lying between the rivers Yenisey and the Lena. It rises to an elevation of about 500 metres, and is highly dissected by rivers.

Mountainous Region: Look at the map and you will find a mountain rim all along its southern and eastern borders. In the extreme south are the Caucasus, the Kopet Dag and the Pamirs. They are the young fold mountains like the Himalayas. So are the mountains of the far east. They also are high and very rugged. Find out a few

high peaks of these mountains and their height from the map. Eastern Siberia including the Kamchatka peninsula is a region of earthquakes and volcanoes. The Urals, Tien Shan and Altai are the old mountains.

Climate and Vegetation

The Soviet Union has extremes of climate, ranging from the bitter Arctic winters to suffocating hot summers of the central Asian deserts. In general winters are long and cold and summers short but warm. The Soviet Union is little affected by the tempering influence of the Atlantic and the Pacific Oceans. Moreover, the northern low-



XIII. A Landscape Around Moscow in Winter

Look at the man skiing on snow. Note the two distinct types of trees in the picture. What natural vegetation belt do you think it must be?

lands are exposed to the cold polar winds. They blow from across the Arctic Ocean which is frozen for nine months. Owing to these reasons the winters in the Soviet Union are extremely cold.

A large part of the Soviet Union receives rain during the short summers. Snowfall is common all over the country. The precipitation goes on decreasing from west to east. It is scanty in north-eastern Siberia and the Caspian-Turan lowland. The heaviest rainfall occurs in the Caucasus Mountains. These mountains get most of their rain in winter. Why should it be so?

There is a great variety in the natural vegetation as well. The

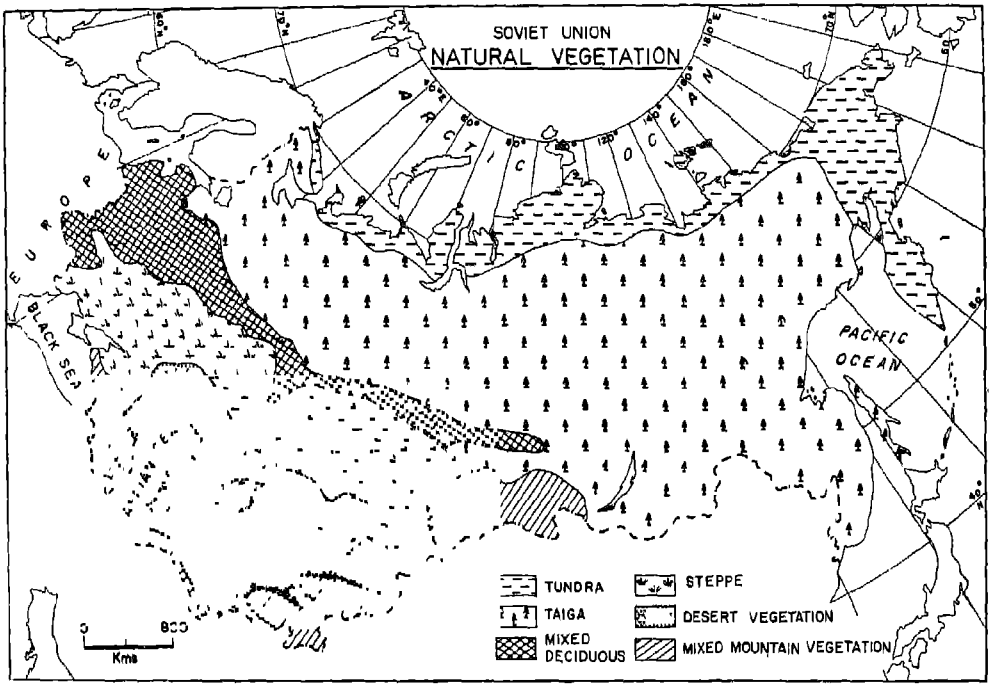


FIG. 19. *The Soviet Union—Natural Vegetation Belts*

Note the vegetation belts from north to south. Do you find any close relation between the vegetation zones and the climatic regions?

country possesses several vegetation belts which succeed each other in more or less a regular sequence from north to south. They are: the tundra, the taiga, the mixed forests, the steppe and the desert vegetation belts. You have already studied them in Asia and Europe. You may revise them from the map in this chapter.

Economic Development

The Soviet Union is very rich in natural resources of all kind. But its valuable resource is its own people. After the Revolution of 1917 the people by their hard labour have done much to develop the vast natural resources of their land. They have made their country one of the strongest in the world.

Agriculture: It is an important occupation of a large number of people in the Soviet Union. Only 10 per cent of its total area is under crops, yet it is very large as compared to that of any other country of the world. But we must not forget that its growing season is very short, generally allowing only one crop a year.

In the Soviet Union all the agricultural land is owned by the State. The individual farmers do not own any land. They, however, till and manage the farms collectively. These large farms are called *kolkhozes*. The kolkhozes are the collective farms or co-operative farming units formed by the peasants. They pool their resources such as land, cattle, implements and seeds.

In kolkhozes each farmer retains for himself a small piece of land which includes a cottage, a kitchen garden and a paddock for his own livestock. He receives a share of the harvest in proportion to his work on the kolkhoz. A fixed proportion of the farm produce is given to the state by way of taxes. All the activities on the farm are done by machines.

In addition to these, there are some farms owned and run exclu-

sively by the government. They are called *sovkhozes*. The managers and the labour on these farms are appointed by the state. These farms specialize in certain products. Their main object is to conduct experiments. They also serve as demonstration farms in different climatic conditions. They are scattered in different parts of the country. These farms have their own machines and equipment.

The Soviet Union produces wheat, barley, rye, oats, maize, sugar-beet, potato, sunflower seeds, flax and cotton on a very large scale.

Wheat is the most important cereal of the Soviet Union. The Ukraine is an important producer of wheat. Rye is the next important cereal. It is the staple food crop of a large number of people. It is grown in the north where soils are poor and climates severe. Oat is grown in the areas which have more severe climate than the rye-producing regions.

Maize cultivation is confined to the warmer and humid lands of the south-west. Potatoes are grown in the humid western and central parts of the Soviet Europe. Sugar-beet and sunflower seeds are grown mainly in the Ukraine.

Flax is grown in the Baltic region and around Moscow. It is used as a fibre. Cotton is an important crop of the warm desert lands of Central Asia.

Animal-rearing: Cattle, pigs, sheep and reindeer are reared in large numbers for their milk, meat, wool and fur. Dairy farming is important in the central and northern parts of the European part of the Soviet Union, especially around Moscow. Beef cattle are reared in the Ukraine, and the steppe grasslands. Pigs are reared on potatoes mainly in the Ukraine. Sheep for both wool and mutton are reared in the dry parts of Central Asia. Reindeer are reared in the far north for their milk and meat. They also serve as beasts of burden in that inhospitable icy region.

Forestry: About two-fifths of the land in the Soviet Union is under forests. The country is the largest store-house of timber. Large quantities of wood are used for preparing pulp, paper and newsprint. The forests are an abode of fur-bearing animals.

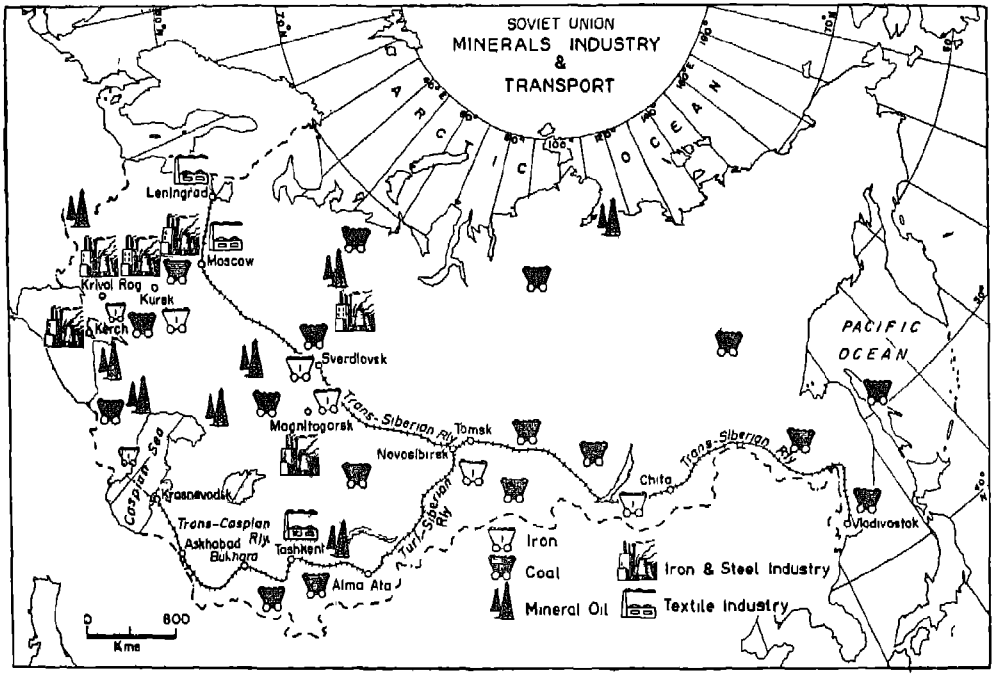


FIG. 20 *The Soviet Union—Minerals, Industries and Transport*

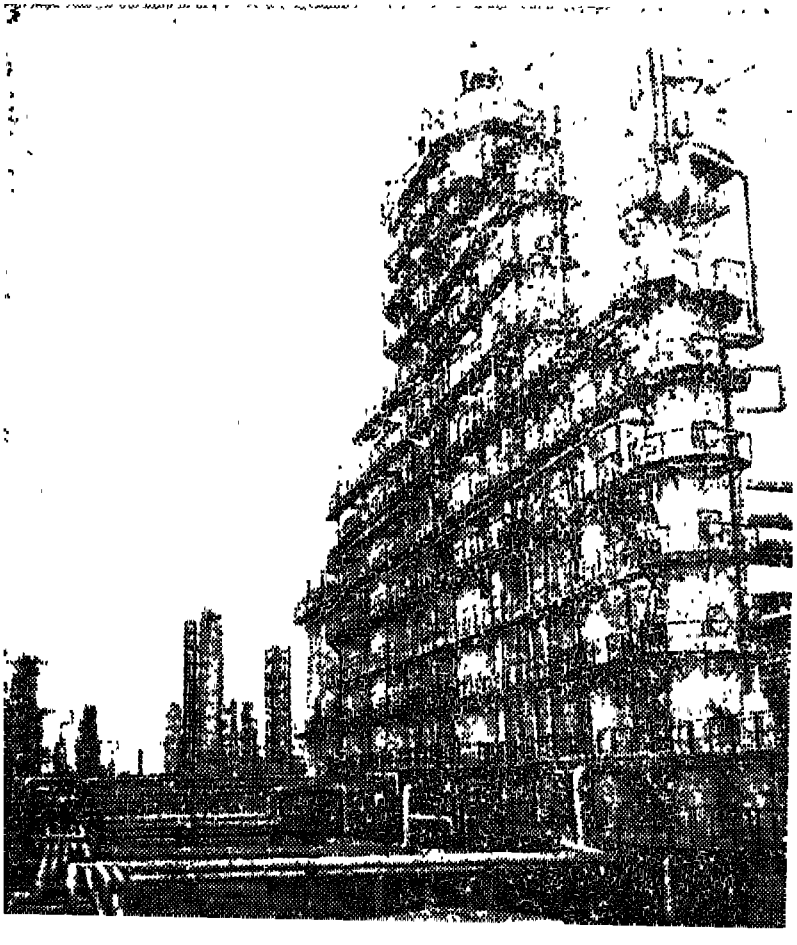
Note the areas producing iron-ore, coal and petroleum. Which are the important iron and steel centres of the Soviet Union?

Mineral and Power Resources: The country is very rich in its mineral resources. It has huge reserves of iron-ore, manganese and bauxite. It also leads the world in the production of iron-ore and manganese. The chief areas of iron-ore mining are in the Ukraine

and in the Urals. The country has very rich deposits of gold. Its other minerals are lead, tin, nickel, copper and potash.

Coal is the greatest power resource of the Soviet Union. It accounts for about one-fifth of the world's production of coal and lignite. The Donetz Basin, the Kuznetsk and the Karaganda are the important coal-fields. Locate them on the map.

The Soviet Union produces about one-sixth of the world's total output of petroleum and natural gas. Its important oil fields are near



XIV. An Oil Refinery in Central Asia.

This huge oil refinery is in the Ferghana Valley in Uzbek Soviet Socialist Republic. Find out this region from your map.

the Caspian Sea, in the Caucasus region and between the Urals and the Volga. The Soviet Union has also considerable deposits of uranium. It helps to produce atomic energy. In what other way is it used?

The Soviet Union has vast resources of water-power. The country has built some of the largest dams of the world for producing hydro-electricity. It also utilizes waters of the rivers Syr Darya and Amu Darya for irrigating its farmlands.

Industries: Iron and steel is the most important industry of the Soviet Union. It is the second largest producer of iron and steel in the world. The Ukraine has a big iron and steel industry. The other centre of this industry lies in the Urals. The country produces tractors, heavy machines, trucks, blast furnaces, arms and ammunition. It also builds ships and manufactures aeroplanes. The centres of its textile industry are Moscow, Leningrad and Tashkent. The country is the largest producer of beet-sugar.

Transport

The Soviet Union is a country of distances. Railways and rivers are the chief means of transport. Look at the map. There is a network of railway lines in the Soviet Europe. The Trans-Siberian railway is the longest railway in the world. Moscow is the largest railway junction. Now attention is also being paid to the construction of good roads.

The flat relief of the country makes its rivers highly suitable for extensive development of inland water transport. In forest areas when the rivers are frozen in winter they serve as natural tracks for sledges. Most of the rivers in the Soviet Union are now interconnected by canals. Moscow has now become a port of five seas—the Caspian Sea, Black Sea, Baltic Sea, Lake Ladoga and Arctic Ocean through the White Sea.

Murmansk is the only ice-free port in the Soviet Union. Despite

its location in the extreme north, the warm Atlantic Drift keeps it ice-free. Some of the important ports are kept open by the ice-breakers.

There has been an amazing development of air transport in the Soviet Union. Moscow and Leningrad are the main air-ports of the country. Aircrafts are of great help in the remote areas like northern and eastern Siberia.

The total population of the Soviet Union is about 233 million which is less than half that of India. The average density of population is only 10 persons per square kilometre. But nearly three-fourths of its population lies in Europe. The eastern part of Siberia is sparsely populated. Moscow, Leningrad, Kiev, Tashkent and Vladivostok are the important cities of the country. Moscow, the largest city, is the capital of the Soviet Union.

The Soviet Union is a home of many nationalities or racia groups. The Russians, Ukrainians and Byelorussians are more numerous than the rest. It is also a country of several languages. The use of Russian as the first official language has helped to unite these diverse peoples into one nation.

THE NEW TERMS YOU HAVE LEARNT: *Kolkhoz*—A large collective agricultural farm where each farmer receives a share of the harvest proportionate to his work. *Sovkhoz*—An agricultural farm in the Soviet Union owned and run by the government. Its main object is to conduct experiments.

EXERCISES

Review Questions

1. Answer the following questions:

(i) What natural features divide the Soviet Union into two continents?
(ii) Which are the two land-locked or inland seas of the Soviet Union?
(iii) Name five main physical divisions of the country

2. Distinguish between:
(i) A kolkhoz and a sovkhoz.

3. Give reasons to account for the following:
(i) Most of the people of the Soviet Union live west of the Urals.
(ii) The Soviet Union has extremes of climate.
(iii) The Ukraine is the granary of the Soviet Union.

4. Make out correct pairs from the two columns:

(i)	An important coal-field in the Soviet Asia	(a)	Vladivostok
(ii)	A famous oil-field on the Caspian Sea	(b)	Krivoi Rog
(iii)	A place in the Ukraine known for iron-ore mines	(c)	Murmansk
(iv)	A port of five seas	(d)	Karaganda
(v)	A port which remains free from ice all the year round	(e)	Baku
		(f)	Moscow

5. Give a brief account of agriculture and the iron and steel industry of the Soviet Union.

Map Work

6. On an outline map of the Soviet Union show the following:
(i) All the neighbouring countries of the Soviet Union.
(ii) The Volga, the Syr and the Amu rivers.
(iii) Moscow, Leningrad, Kiev, Tashkent, Vladivostok and Irkutsk.

Topic for Class Discussion

7. *The People of the Soviet Union*

Collect information on the people of the Soviet Union—various nationalities, races, languages and the occupations they follow. Note the points of similarities and dissimilarities between the peoples of the Soviet Union and India.

UNIT THREE

INDIA—OUR MOTHERLAND

India is a well-knit geographical unit having an individuality of its own. Various geographical divisions of India are so interdependent that no part of the country would be able to grow to its maximum without assistance from the other.

The annual cycle of seasons in India is dominated by the monsoons. All over India there is a common seasonal rhythm to which every kind of life responds. The mighty Himalayas lend this country a distinct tropical touch and a monsoonal unity almost from one end of the country to the other.

Soil is the most important resource of our people. Directly or indirectly we derive all our food and many of our necessities from nothing but soil. We need to make the best possible use of every patch of land keeping in view its merits and demerits. The same is true of our other equally precious natural resources—water, natural vegetation, wild life and mineral resources. It is our solemn duty to avoid wastage and destruction of these resources.

Key to our all-sided and rapid development lies in modernising our agriculture which forms the base of our economy. Development of our mineral resources is a must for the rapid growth of our industries. Similarly, the means of transport and communication serve as lifelines of our nation. They bring our people close to one another not only economically but culturally as well.

Finally, it is the people who are the greatest resource of any country. It is not the quantity but the quality of our people that would make our country wealthy and prosperous, enabling us to raise the standard and quality of our living.

10

The Face of Our Motherland

THE TERMS YOU ALREADY KNOW: *Tropic of Cancer*—An imaginary circle running along the earth's surface at an angular distance of 23°30′ from the equator to its north. Running parallel to the equator it marks the northern limit of the Tropical Zone. *Standard Meridian of India*—The meridian of 82°30′ E whose local time serves as the standard time for the whole country.

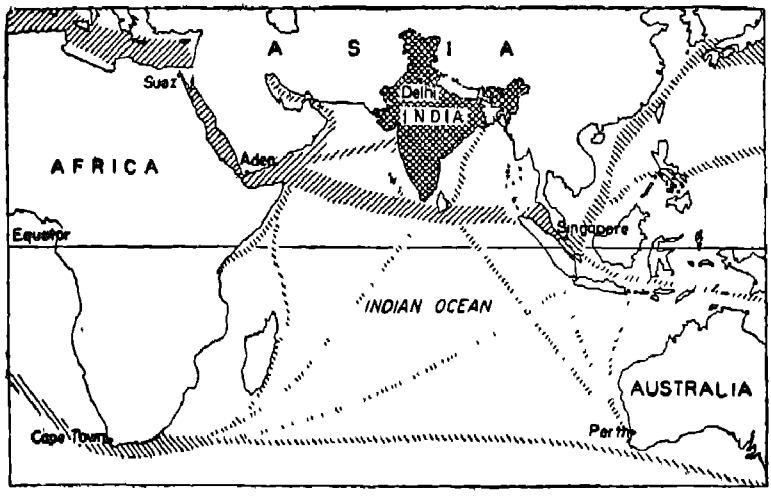
INDIA, that is Bharat, is a land of lofty mountains and mighty rivers. Extensive are its plains and no less wide are its plateaus. A vast land with such varied relief is inhabited by about 547 million people. However, they have several things in common in spite of their outward differences.

A geographical study of this ancient and populous country will help us appreciate the differences in the ways of living from region to region. It will also explain physical and other basic factors that bind the diverse people into a great nation—OUR INDIA.

Location and Size

India is situated at the head of an ocean named after itself. Ours is the only country after which an ocean is named. This tells us how important our country was even in olden times in international

trade and commerce. Look at the picture of a globe and note how centrally situated it is in relation to Asia, Europe, Africa and Australia.



The territorial waters of India extend into the sea to a distance of twelve nautical miles measured from the appropriate base line.

FIG. 21. *Location of India*

Note the location of India in relation to international sea-routes and air-routes.

Note the degrees of latitude within which India is situated. What hemisphere is it? Do you see the Tropic of Cancer running almost half-way through the country? India thus lies in the tropical and sub-tropical zones of the Northern Hemisphere.

Kanyakumari, the southernmost tip of the mainland of India is only 8° north of the equator. Closer still to the equator is the Great Nicobar Island of India. At these places the sun is almost overhead all the year round; and the maximum difference between the length of the day and night is hardly 45 minutes. But at the northernmost point of India the rays of the sun are always oblique. There the maximum difference between the length of the day and

night becomes as large as five hours. These two extreme points of India are 30° apart—a distance of over 3,200 kilometres. It is as much as one-twelfth the earth's total circumference!

Look at the map and note that India is situated between 68° E and 98°E longitude. This is again a distance of 30° longitude which comes to about 3,000 kilometres. What does it convey? It means that the sun takes full two hours to rise at Dwarka after it has done so in the easternmost part of Assam. In order to avoid any confusion of time from place to place in so vast a country as ours, 82° 30′ E longitude is taken to be the Standard Meridian of India. The local time along this meridian serves as the Indian Standard Time (IST) for each and every place in the whole of India.

India occupies the south-central peninsula of the Asian continent. This peninsula tapering towards the south, divides the northern part of the Indian Ocean into two--the Arabian Sea and the Bay of Bengal. This gives India a long coastline of about 5,700 kilometres. With Ceylon situated very close to its southern tip and the highest crest of the Himalayas determining much of its northern borders, India has indeed a very pleasing shape. The country's land frontier alone is as long as 15,200 kilometres. Add the length of the coastline to this figure and it would amount to going half-way round the world!

Besides the Indian mainland a few groups of islands are a part and parcel of the Indian Union. Off the coast of Kerala in the Arabian Sea are the islands of Amindivi, Laccadive and Minicoy. Most of these are small coral islands. In the Bay of Bengal is the group of Andaman and Nicobar Islands. They are fairly large both in size and number.

Study the map of India and name the countries that have a common frontier with our country. They are Pakistan, Afghani-

stan, China (Tibet), Nepal, Bangla Desh and Burma. Then there are two small Himalayan Kingdoms of Sikkim and Bhutan whose defence is the responsibility of India.

A narrow stretch of water, namely the Palk Strait, separates Ceylon from the Indian mainland. Look at the Andaman and Nicobar Islands. Facing them across the sea are Indonesia, Malaysia, Thailand and Burma. Even the first three countries situated not far from these islands are in a way our next door neighbours.

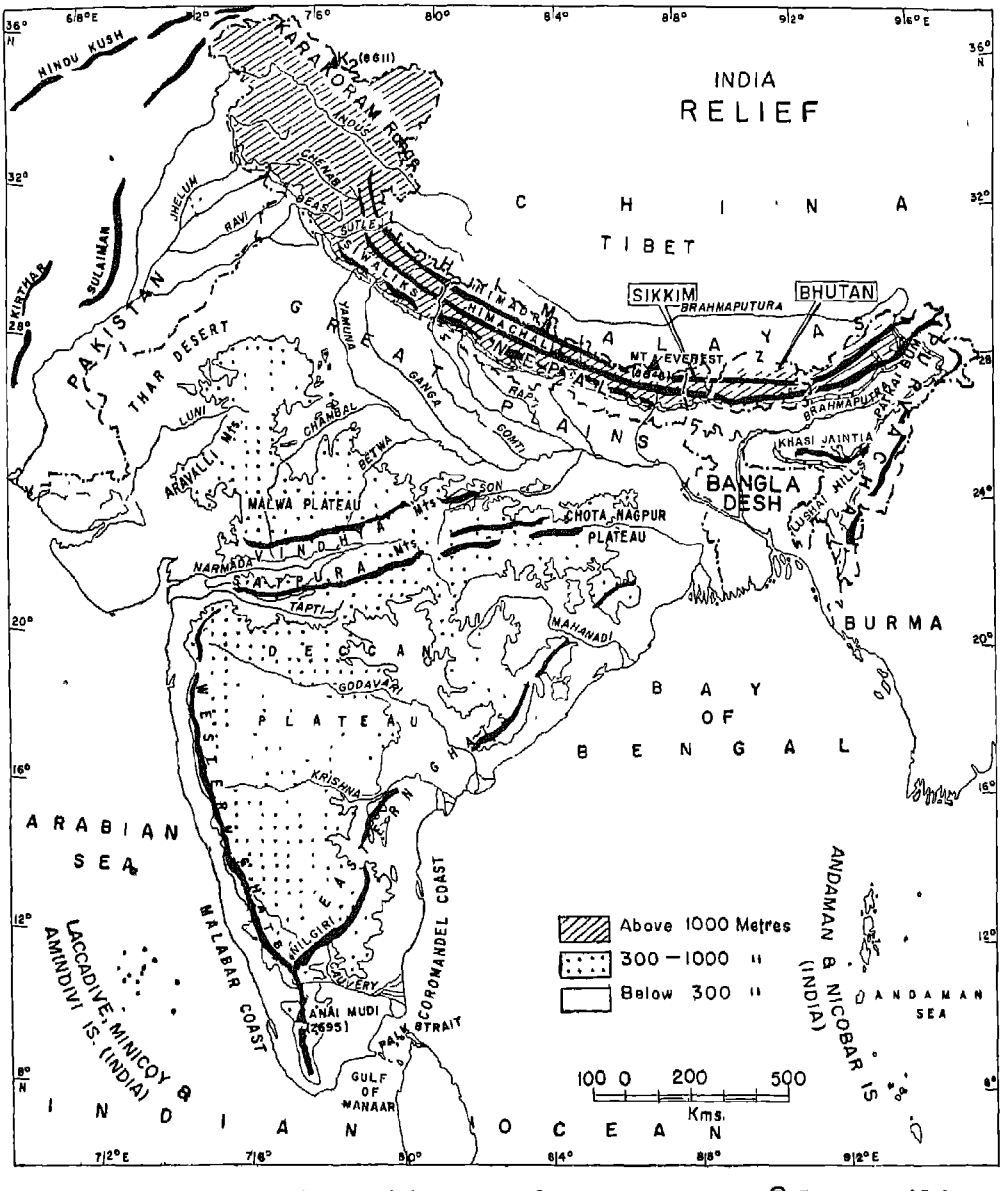
India is the seventh largest country of the world. With a total area of over 3.2 million square kilometres it accounts for nearly two per cent of the world's total land area. But this is big enough to include about two dozen nations of Western Europe. Can you now imagine how large our country is?

Relief and Physical Divisions

Look at the map of southern Asia. You will see a great chain of mountains separating Pakistan, India, Bangla Desh and Nepal from the rest of the continent. Such a big geographical unit which stands out distinctly from the rest of the continent is often called a *sub-continent*. It is difficult to study the relief features and drainage of India without reference to the Indian sub-continent as a whole.

Our country consists of three main physical divisions. They are the Great Mountains of the North, the Great Plains of Northern India and the Great Plateau of Peninsular India. The southern plateau is flanked by narrow coastal strips. But they are a part and parcel of the peninsular land mass.

The Great Mountains of the North : Look at the map of India. You will see a chain of mountains all along the northern frontiers of our country. This chain of mountains lies between the Plateau of Pamir on one end and the frontier of Burma on the other, covering a distance of nearly 3,000 kilometres. The width of this moun-



Based upon Survey of India map with the permission of the Surveyor General of India.

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The territorial waters of India extend into the sea to a distance of twelve nautical miles measured from the appropriate base line.

FIG. 22. *Indian Sub-continent—Relief*

Note the three major physical divisions of India. What are the important water-divides in India?

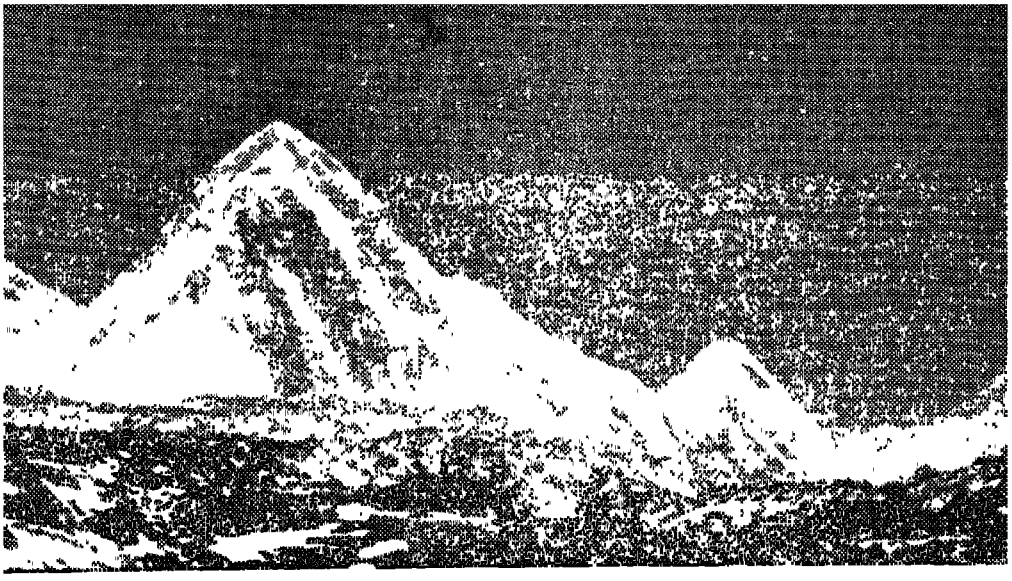
tainous belt varies between 250 and 400 kilometres.

These arc-shaped mountains have high peaks, steep slopes and deep valleys. The snow covered mountain peaks, high glaciers, deep gorges and thick forests make these sunny mountains one of the most attractive regions of the world. These highest mountains of the world are among the young mountains on the earth. The parallel ranges of these mountains make it further clear that they are fold mountains.

The mountains ranging between the Pamir Plateau and the Indus river in Kashmir are known as the Karakoram Mountains. Thereafter the mountains between the Indus on one hand and the Brahmaputra on the other are known as the Himalayas. The extension of these mountains along the eastern border of our country in Assam is known as the Purvachal.

The Karakoram Mountains in the northern part of Kashmir are the north-western extension of the Himalayas. K_2 the world's second highest mountain peak belongs to this mountain range. Also famous is its Baltoro glacier. The other important ranges of the Kashmir Himalayas are the Ladakh, the Zaskar and the Pirpanjal. But the most famous and beautiful is the Kashmir valley drained by the Jhelum river.

The northernmost range of the Himalayas proper is known as Himadri. On an average it is about 6,000 metres high. This loftiest Himalayan range contains the world's highest peaks many of which are more than 8,000 metres above sea level. Mount Everest in Nepal is the world's highest peak with an elevation of 8,848 metres above sea level. Some of the other peaks are Nanda Devi, Dhaulagiri, Annapurna, Manaslu, Makalu and Kanchenjunga. Most of these peaks are in Nepal. Nanda Devi is the highest peak of the Himalayas in India.



XV. High Peaks of the Himalayas

These peaks are in the neighbourhood of Mount Everest. Note the sharp features of these snow covered peaks. In what country are they situated?

The range lying south of the Himadri is known as Himachal. The average height of this range is a little less than 5,000 metres above sea level. On this range are situated many of the important hill stations of India. They are Simla, Mussoorie, Naini Tal and Darjeeling.

The southernmost range of the Himalayas is known as the Siwaliks. It is not a continuous range. In fact, towards the east it merges with the main mountains. This range is made up of mud and soft rocks. The average height of this range is less than 1,250 metres above sea level.

In the north-east, the Purvachal mountains consist of Patkai Bum and the Naga Hills in the north, Garo, Khasi and Jaintia in the centre and the Lushai Hills in the south.

The Great Plains: To the south of the Great Mountains of the north lie the Great Plains of Northern India. This region made

up of alluvium is extremely level. It extends over about 2,500 kilometres from east to west. In fact, the region as it is now is primarily a gift or a creation of the mountainous region of the north. This is because the rivers rising from the Himalayas have brought with them this material making this region one of the most fertile tracts in the world. At one time this part was occupied by a shallow sea called the Tethys.

The Great Plains consist of two river basins, namely those of the Indus and the Ganga-Brahmaputra. The Indus, the Ganga and the Brahmaputra are the three most important rivers of the Indian sub-continent. Two of them—the Indus and the Brahmaputra—rise beyond the Himalayas. All three flow through India, then enter either into Pakistan or Bangla Desh and then join the sea.

Now only a part of the Indus basin lies in India. It is drained by the river Indus and its tributaries: the Jhelum, Chenab, Beas, Ravi and Sutlej. Of these, the Sutlej also rises beyond the Himalayas. The waters of these rivers flow into the Arabian Sea.

The major portion of the Great Indian Plains consists of the Ganga Basin. It is partly drained by the Yamuna, Ganga, Ghaghara, Gandak, Kosi and Tista. All of them rise in the Himalayas. Another set of the tributaries of the Ganga consists of the Chambal, Sind, Betwa, Sone and Damodar. They rise either in the Vindhyas or in the Chhota Nagpur region.

The river Ganga in its lower reaches is joined by the great Brahmaputra. Together they form the world's largest delta before their waters flow into the Bay of Bengal. The major part of the Ganga-Brahmaputra delta lies in Bangla Desh.

The line of demarcation between the basins of the Indus and the Ganga is not very clear. This water-divide lies in Haryana. At Ambala it is hardly 282 metres above sea level. It shows how

gently the land slopes towards the Arabian Sea on one hand and the Bay of Bengal on the other.

The Great Plateau of Peninsular India : South of the Great Northern Plains lies the Great Plateau of the Peninsula. This plateau made up mostly of hard and igneous rocks is the oldest part of the Indian sub-continent. It consists of two distinct parts—the Malwa Plateau in the north and the Deccan Plateau in the south.

The northern part of the Great Plateau of Peninsular India is bounded by the Aravalli Mountains in the west and the Vindhyas in the south. It consists of the Plateaus of Malwa, Bundelkhand, Baghelkhand and Chhota Nagpur. They all slope towards the north merging gradually into the plains of northern India. Note that all the rivers of this region form part of the Ganga Basin.

To the north-west of the Malwa Plateau lies the Desert of Rajasthan. It lies west of the Aravalli Mountains. The desert is made up of rocks and sand. It extends into Pakistan. A few small rivers in this part of the Thar Desert either drain into salt lakes or disappear into sands. Thus it is a region of inland drainage.

The western edge of the Deccan Plateau is formed by the Sahyadri, the Nilgiri, the Annamalai and the Cardamom Hills. They are all collectively known as the Western Ghats. Overlooking the Arabian Sea, they run parallel to the coast. Their average height goes on increasing from north to south. With an elevation of 2,695 metres above sea level Anai Mudi in Kerala is the highest peak of peninsular India. The Deccan Plateau gently slopes towards the east and its height varies from 300 metres to 900 metres above sea level. The eastern edge of the plateau is marked by the hills which are low and discontinuous. They are collectively known as the Eastern Ghats.

The northwestern part of the Deccan Plateau covering almost

the whole of Maharashtra and the parts of Gujarat and Madhya Pradesh is made up of volcanic rocks called the Deccan Trap. They are made of lava flows.

The river Narmada flowing from east to west separates the plateau of Malwa from the Deccan. It flows through a narrow valley between the Vindhyas in the north and the Satpura Mountains in the south. To the south of Satpura Mountains lies yet another west-flowing river, the Tapti. Like the Narmada it also joins the Arabian Sea. All other major rivers of the Deccan Plateau—the Mahanadi, Godavari, Krishna and Cauvery—flow into the Bay of Bengal. The Godavari is the longest of them all.

The Deccan Plateau is flanked by a narrow coastal plain on the west. It is broadest in the north where it includes the plain of Gujarat. The coastal strip south of Gujarat is divided into two—Konkan in the north and the Malabar in the south. The coastline is slightly indented having estuaries in the north and lagoons or back-waters in the south especially in Kerala. In Bombay and Marmagao it possesses the two best natural harbours of India.

The eastern coastal strip is wider than the west and possesses the fertile deltas of the Cauvery, Krishna, Godavari and Mahanadi. The southern part of east coast is known as the Coromandel coast. The coastal strip in the north merges with the delta of the Ganga-Brahmaputra.

Geographical Unity of India

All the major physical divisions of India are closely related to one another. These parts are also interdependent. The story of how India acquired its present form and shape is very, very old; and highly interesting. Scientists believe that the Himalayas were once lying at the bottom of a shallow sea. They gradually rose above

the sea level when the land masses of Peninsular India on one hand and the Asian mainland on the other began to come closer and closer. In course of time the Himalayan Mountains acquired sufficient height, and the rivers flowing from them helped to form the Great Indian Plains.

The Great Mountains of the north in the past have protected India from the rest of the continent. This helped India to grow and prosper in peace. This is why India has been able to develop a distinct culture and nationhood of its own. Today this mountainous region is the storehouse of its forest wealth and water-power. The Great Plains of Northern India are one of the most important and fertile farmlands of the world. It sustains nearly two-fifths of the total population of India and provides agricultural raw materials for various industries of the country. The Great Plateau of India is the most important storehouse of minerals on which our modern industries depend. The coastal strips particularly on the east contain important rice bowls of India. Our major port towns, besides being big centres of internal trade, have now become the gateways of our international trade and commerce. In fact no one part of our country would be able to grow to its maximum without adequate assistance from the other.

THE NEW TERMS YOU HAVE LEARNT: *Sub-continent*—A big geographical unit which stands out distinctly from the rest of the continent. *Indian Standard Time* (IST)—The local time along the Standard Meridian (82° 30′ E) which serves as the standard time for the whole of India. It is five and a half hours ahead of Greenwich Time.

EXERCISES

Review Questions

1. Answer the following questions in brief:
   (i) What are the three major physical divisions of India?
   (ii) Name the three largest rivers of the Indian sub-continent.
   (iii) Which is the highest Himalayan Peak in India?
2. Distinguish between:
   (i) the eastern coast and the western coast of India.
   (ii) the mountains of Northern India and the mountains of peninsular India.
3. Describe in about 15 lines either the Himalayan Mountains or the Deccan Plateau.
4. Make out the correct pairs from the two columns:

(i)	the highest peak of the Indian sub-continent	Baltoro
(ii)	the highest peak of the Karakoram	Mt. Everest
(iii)	the highest peak of the Himalayas in India	Anai Mudi
(iv)	the highest peak of Peninsular India	Nanda Devi
		K_2

Map Work

5. Draw a map of India and show therein the following:
   (i) The highest range of the Himalayas.
   (ii) The two great rivers that rise beyond the Himalayas.
   (iii) Five deltas along the Bay of Bengal.
   (iv) Two west-flowing big rivers of the Deccan Plateau.

Topic for Class Discussion

6. *Frontiers of India*

   Divide the class into six groups, each one dealing with our frontier with one of the countries (i) Pakistan; (ii) China; (iii) Nepal; (iv) Bangla Desh (v) Burma. Let there be one more group to deal with the strategic importance of our islands in the Bay of Bengal and in the Arabian Sea.

11

India—the Land of the Monsoons

THE TERMS YOU ALREADY KNOW: *Monsoon*—A complete reversal of winds over a large part leading to a change of seasons. *Trade Winds*—The winds which blow in the same direction from subtropical high pressure belts to the equatorial low pressure belt.

THE land and climate together influence the life of the people in our country from region to region. You know how varied is its relief and beautiful its landscape from place to place. It has several 'greats' to its credit— be it the mountains, or the plateaus or the plains. Its mountains and hills, lakes and rivers, beaches and back-waters attract thousands of tourists from all over the world. You will see that apart from location, shape and size of our country, its relief also plays a great part in shaping its climate.

A study of the climate of our country and its variations from region to region will further confirm that our big country is indeed a sub-continent. In spite of these climatic variations, you will also see that the monsoons lend a climatic unity to this land known for its diversity.

Climatic Contrasts

Some places in our country have an extremely hot climate making it difficult even to stand in the sun. Some others have too cold a climate. Certain places enjoy an equable climate all the year round. In some of these places even the difference between the summer and winter mean temperatures is less than what it is between those of the day and night. As against this, some places in India have an extreme type of climate. If certain places are well-known for the heaviest rainfall anywhere in the world, the others are known for their extreme aridity. In many parts of the country it only rains; but in some it even snows, and that too very heavily.

Study the temperature and rainfall graphs given in this chapter. They show mean monthly temperatures and rainfall for a few selected places in India. Now you should be able to describe the climate of each place, comparing it with others.

Which of these places has the most equable climate ? Name the two places having the most extreme type of climate. Which two places have a considerable rainfall in winter? Which of these places is most rainy? Which one is most arid? Which are the rainy months for the most parts of India? It will be interesting to know the factors that are responsible for differences as well as similarities between the climates of different regions.

Factors Influencing the Climate of India

You already know that the southern half of our country lies within the tropics, whereas the northern half belongs to the sub-tropical zone. Yet the whole country has almost uniformly high temperatures especially in summer. By and large, the winters are dry. Together they lend an unmistakable tropical touch to our country's climate.

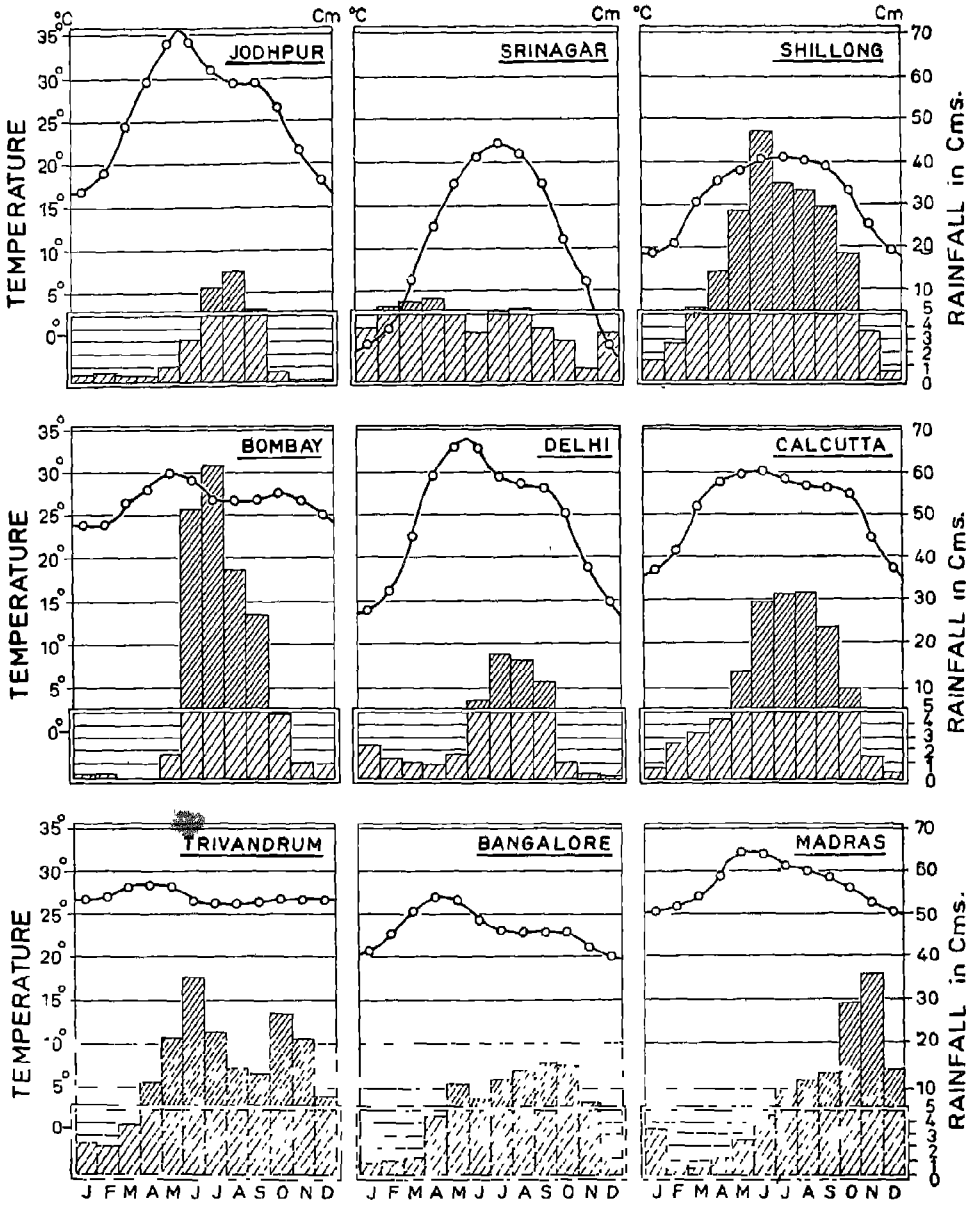


FIG 23 *Temperature and Rainfall of Some Places in India*

Locate these places on a map of India. Make out pairs of places having opposite type of climate: (a) hot and cold; (b) arid and rainy; (c) equable and extreme.

This tropical nature of the climate all over India is in a large measure due to the Himalayas. The long and wide ranges of this mountain system with their great elevations protect our country from the cold winds of north. The Himalayas are not only a physical barrier but they also act as a great natural wall separating two distinct climatic regions. They thus act as a *climatic divide* as well.

With a long coastline India has a large coastal area enjoying equable climate. But a far greater area of the country, especially in the north, lies too far away to receive any moderating influence of the sea. Such a continental effect on the Indian climate can be seen even in the interior of the peninsula.

Yet another factor affecting the temperatures in India is the relief of our land. On the Deccan Plateau even when they are not far from the equator there are popular hill stations, for instance Ootacamund, also known as Ooty. However, most numerous and popular of the hill stations are confined to the Himalayas. On what range are they situated? The Kashmir Valley is often called the paradise on the earth. What makes it so?

In fact, it is the variations in rainfall from place to place that account for marked differences in the climate of our country. These are again governed to a large extent by the relief of our land. A place like Mahabaleshwar situated on the crest of the Western Ghats may receive as much as 625 centimetres of annual rainfall. But a place like Poona only a few kilometres to its north-east hardly receives about one-tenth this amount.

The gigantic relief features like the Himalayan ranges even deflect the winds. They are, in fact, responsible for trapping the monsoon winds forcing them to shed their moisture inside the Indian sub-continent.

Cycle of Seasons in India

Let us follow an annual cycle of seasons starting with the month of January. The cold weather season all over India has well set in by early December. Recall the planetary winds, and you will remember that India lies in the belt of the trade winds. It being the Northern Hemisphere, they are north-east trades. January and February are the two cold months almost all over India. During these months the day temperatures in Calicut and Madras are about 24° C or 25° C. In the Northern Plains they are about 10° to 15° C. Days are fairly warm even though the nights are cold.

During this season there is a high pressure area developed over the plains of the north-west. Land-bearing light winds blow out from them. Weather is very fine with clear skies, enjoyable sun and light winds.

In Northern India, however, this fine weather is disturbed at intervals by clouds and light rains. These winter rains are associated with cyclones originating in the Mediterranean Sea. They travel eastward across Iran and Pakistan before entering north-western part of our country. It is these winds which cause heavy snowfall in Kashmir and in the Himalayas. The rainfall caused by these winds decreases towards the east and the south. These "western disturbances" in our country are often followed by cold waves.

During this season the Coromandel coasts of Tamil Nadu also receive winter rains. These are, however, due to the north-eastern monsoons. These winds pick up fresh moisture while blowing over the Bay of Bengal before striking the coasts south of Madras

The period between March and May forms the summer season. This season marches, as it were, from south to north. In the month of March the highest day temperatures of about 38° C are recorded in the

southern and central parts of the Deccan Plateau. In April, the belt of the highest temperatures shifts further north and lies in Gujarat and Madhya Pradesh where day temperatures vary from 38° C to 43° C. In the month of May the belt of the highest temperatures moves still further north. The day temperatures around 48° C are recorded in the north-western part of the country.

During this period, Northern India becomes a region of rising temperatures and decreasing air pressure. Violent local storms accompanied by rain and hail are not uncommon towards the end of this period. In the north-west the hot dry winds called *loo* are common in the months of May and June. So are the dust storms. Temporarily though, they help to bring down the temperatures appreciably.

A period from June to September is a south-west monsoon season. The low pressure area developed in the north becomes more and more intense. The south-east trade winds which blow from the Tropic of Capricorn in the Southern Hemisphere towards the equator are attracted towards this low pressure area in North India. These moist winds extend into the Bay of Bengal and the Arabian Sea. Suddenly they are caught up in the air circulation over India. They are deflected towards the Indian Peninsula and Burma as south-westerly winds.

The direction of these winds is controlled by the relief of our country. The Indian peninsula divides the monsoons into two branches, the Arabian Sea branch and the Bay of Bengal branch. The Arabian Sea branch of the monsoons marches from the southern tip of the country towards the north. The Bay of Bengal branch of the monsoons is deflected by the Arakan Mountains of Burma and the Himalayas in India and moves up the Ganga basin. The monsoons break in Kerala by the beginning of June and reach the plains of the Punjab by the first week of July. These two branches together

thus overrun the country in about four or five weeks' time. The bulk of the annual rainfall is received during this season in the whole country barring the east coast of Tamil Nadu.

Even during this period it does not rain continuously. Heavy showers or downpours are generally followed by rainless intervals. These successive waves of rainfall, as it were, depend upon the formation of cyclones in the Bay of Bengal and the paths they follow.

Then comes the period of retreating south-west monsoons. By October the intensity of rainfall becomes much less, and the south-west monsoons begin to retreat gradually. They withdraw from the Punjab by about mid-September, and leave the Ganga Delta by late October. The south-west monsoons bid an annual farewell to India by early November when they leave the southern part of the peninsula.

With the retreat of monsoons, the month of October again is known for its oppressive heat. This "October heat", as is popularly known, is due to a combination of high temperatures and excessive humidity, since the land is still water-logged. In late October, temperatures begin to decrease rapidly especially in northern India, and by December, the winter is well established. Thus the months of October and November form a period of transition from a hot rainy season to the dry winter conditions.

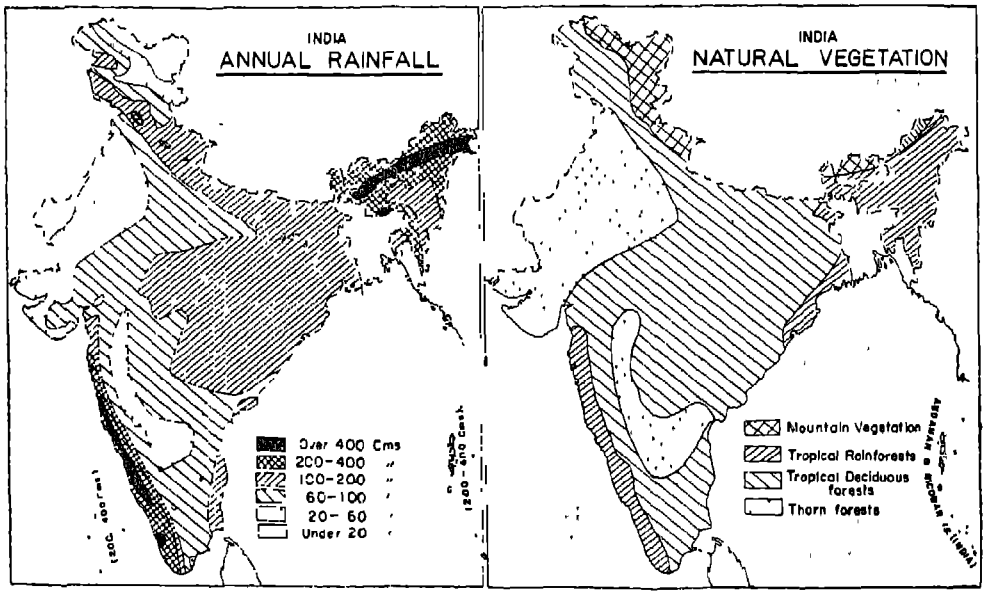
This period of transition in which the low pressure area is transferred from north-west India to the Bay of Bengal is marked again by the formation of cyclones. These cyclones generally enter into the Indian peninsula through the mouths of the river valleys causing widespread havoc in the deltas of the Cauvery, Krishna and Godavari. Occasionally they hit the coast of Orissa and Bengal causing damage in the deltas of the Mahanadi and Ganga-Brahmaputra. You may recall the havoc caused in Bangla Desh in the year 1970. For

the Coromandel coast these are the rainiest months. In this part, rainfall is further continued by the north-east monsoons.

Thus the annual cycle of seasons in India is dominated by the monsoons. There is some kind of a seasonal rhythm to which every kind of life—plant, animal and human—responds. In spite of abundant rainfall, India is a water-thirsty land. This is largely due to the concentration of rainfall over only a few months of the year. The rapid run-off and the quick evaporation of rain-water are further responsible for this water famine even in those parts where rainfall is very heavy.

The monsoons are eagerly awaited all over India. Long breaks

FIG. 24. *India—Distribution of Rainfall and Natural Vegetation*
Note the regions of heavy rainfall. What correlation do you notice between rainfall and natural vegitation?



The territorial waters of India extend into the sea to a distance of twelve nautical miles measured from the appropriate base line.

or delays in them are fraught with danger. The whims or vagaries of the monsoons form the most important topic for discussion throughout the length and breadth of the country. Floods and droughts are constant sources of worry and no part of India is totally free from one or the other.

Distribution of Rainfall

In India the distribution of rainfall is determined by two important factors. They are the direction of the rain-bearing winds, particularly the south-west monsoons and the relief of the land.

The Arabian Sea branch of the monsoons striking the west coast has to climb up the Western Ghats. As the warm moist winds rise up they become cold and are forced to 'throw out' or drop down the moisture they carry. Thus heavy *precipitation* takes place on the western coastal strip and all along the Western Ghats. The rainfall in this belt decreases gradually from south to north. Why should it be so?

As these winds cross the Western Ghats they begin to climb down. By this time they have already shed much of their moisture they have carried. While climbing down they begin to get warm, increasing thereby their capacity to hold moisture. As a result they give very little rain in a belt spread along the eastern side of the Western Ghats. This is a typical *rain-shadow area.*

Note that Western Rajasthan receives a very scanty rainfall. This is because the winds while passing over the Great Rajasthan Desert become more warm and increase their capacity to retain moisture.

The south-west monsoons of the Bay of Bengal branch move northwards to central Burma, where also lies a low pressure area. But the Arakan Mountains succeed in deflecting a sizable part of these winds northwards. Thus these winds take a southerly to southeasterly direction and move into the Ganga-Brahmaputra delta. A consi-

derable part of these winds gets trapped into the valleys of the Brahmaputra and the Surma in the east, and cause heavy rainfall in this region. The strong monsoon winds are funnelled into a narrow valley surrounded by hills on three sides causing the world's heaviest rainfall at Cherrapunji, about 1080 centimetres per annum on an average.

A very large proportion of the Bay of Bengal branch of the south-west monsoons is attracted by the low pressure lying over the northwestern part of the country. These winds move up the Ganga basin over which lies a low pressure trough. The Himalayas are responsible for deflecting these winds up the Ganga basin. Look at the rainfall map. You will see that the rainfall goes on gradually decreasing from east to west.

Even in the Himalayas the rainfall decreases from east to west since these winds become progressively dry as they move towards the west. The Kashmir Himalayas and the Western Himalayas receive more of snow and less of rainfall. Much of it is received in winter as a result of the western disturbances.

As you know, the southern part of the peninsula receives considerable rainfall during the period of the retreating monsoons. The coast south of Madras is the only region in India which receives any rainfall from the northeastern monsoons in late December and part of January.

But for the monsoons, India would have been a country altogether different. Besides the monsoons, the relief, particularly the mighty Himalayas, also plays a great role in shaping the climate of our country. It gives the country a distinct tropical touch and a monsoonal unity almost from one end of the country to the other.

Natural Vegetation

Natural vegetation is an index of climatic conditions. It also forms part of the physical setting.

Most of the original land cover, namely, the natural vegetation in most parts of the country has been removed by man. Unlike the savanna lands, the original land cover in India consisted of forest vegetation. Even today, India possesses a great variety of natural vegetation. This is mainly because of two factors—(i) great variations in relief and (ii) the amount of rainfall. The Himalayan region stands out very distinctly from the rest of the country in this regard.

The country lying outside the Himalayan region is divided into three major vegetation belts. They are (i) tropical rain forests; (ii) tropical deciduous forests and (iii) thorn forests.

The Tropical Rain Forests · These forests consist of two varieties—evergreen and semi-evergreen. The former lie in the region with a rainfall over 300 centimetres. It is a region of high humidity, even temperature and a short dry season. These forests are common on the rainy slopes of the Western Ghats and in the hills of Assam. The semi-evergreen forests lie close to the evergreen forests. They belong to a region receiving rainfall between 200 and 300 centimetres per year. They are found in Western Ghats, Assam, Bengal and Orissa.

The Tropical Deciduous Forests : These forests are the most typical of the monsoon region. Therefore, they are also called the monsoon forests. They belong to the region enjoying a rainfall between 100 and 200 centimetres per annum. Owing to a long dry spell, trees shed their leaves for about six to eight weeks in summer. Every species has its own time of shedding leaves. As a result at no time is the entire forest absolutely bare. Teak and sal are the most important trees of these forests. Sandalwood, rosewood, ebony, shisham and mahua are the other species of economic importance. Bamboos are also very common. This vegetation belt extends from the Western Ghats in the south to the Siwaliks in the north.

XVI A Teak Forest in Spring

Look at the tall straight trunks of the teak trees. This forest lies on the borders of Kerala and Mysore States. Can you judge the height of these trees ?

The Thorn Forests They are confined to the regions having a rainfall of less than 80 centimetres a year. It consists of open stunted forests and bushes. Trees like babul, kikar and wild palms are common in a region with a moderate rainfall. Scrubs, shrubs and thorny

bushes are mainly confined to a region where the rainfall is very scanty. Most of these trees and bushes have deep roots and long thorns. This vegetation is found in Rajasthan, Punjab, Haryana, Gujarat, and the dry parts of Madhya Pradesh and the Deccan.

Yet another special type of natural vegetation consists of tidal forests common only to the areas flooded by the tides of the sea. Mangroves and the *sundari* trees of the Sundarban in Bengal are the common trees of this category.

Vegetation of the Himalayan Region : Vegetation in this region varies according to the height or altitude of the region. The foothills of the Himalayas are covered with tropical deciduous forests. *Sal* is the most important tree in this belt. This is followed by subtropical hill vegetation further up. The forests there consist of evergreen oaks, chestnuts, chir and chil trees. When we reach an altitude between 1,600 to 3,300 metres we find a belt of coniferous trees—pines, cedar, silver-firs and deodars. Thereafter the alpine variety of vegetation becomes more and more common. It consists of shrubs, scrubs and grasses. They are found at 3,500 metres and above, till we reach the permanent snowline.

THE NEW TERMS YOU HAVE LEARNT: *Climatic Divide*—A bold relief feature separating distinct climatic regions lying on either side. *Rain-Shadow Area*—Area lying on the leeward side of mountains or a plateau which receives a little or no rain.

EXERCISES

Review Questions

1. Answer the following questions:
   (i) Into how many seasons will you divide a year to explain the climate of India?

(ii) What is relief rain?
(iii) Why are the Himalayas called a climatic divide?

2. Distinguish between:
(i) The retreating monsoon and the north-east monsoons.
(ii) Precipitation and rainfall.

3. Complete the following statement with a correct ending:
Jodhpur receives very scanty rainfall because
(i) it lies in the region of land-bearing winds
(ii) it lies in a region too hot to allow precipitation.
(iii) it lies in the rain-shadow area.
(iv) the Aravallis obstruct the rain-bearing winds.

4. Write in brief how and why India receives the bulk of its rainfall in the months from June to September.

5. Name important natural vegetation belts of India.
Describe the characteristics of the monsoon forests.

Map Work

6. On a map of India show the following:
(i) A place having the world's highest rainfall.
(ii) A region receiving rainfall from the north-east monsoons
(iii) Areas receiving rain from the western disturbances.
(iv) Direction of winds of the Bay of Bengal branch of the south-west monsoons.

Topic for Class Discussion

7. *The Importance of the Himalayas for us*

Let the class discuss this topic after dividing itself into four groups each one dealing with one of the topics: (i) the Himalayas and the making up of our country (ii) the Himalayas and our frontiers (iii) the Himalayas and the climate of our country (iv) any other point.

12

The Soil—Our Prime Resource (I)

THE TERMS YOU ALREADY KNOW: *Soil*—Loose rock material together with humus that forms the upper layer of the earth's crust. It serves as a source of food and moisture for plants. *Agriculture*—A systematic practice of tilling or cultivating soil, raising crops and trees and rearing animals.

YOU know how bountiful Mother Nature is. Her precious gifts include soil, water and natural vegetation. Fish and wild life, too, form part of the gifts of nature. So also the mineral wealth hidden under the earth's surface. Together they are known as *natural resources*. Of these, the soil is the most important resource for mankind.

Think of the food that helps you to sustain and grow. The cereals like wheat, rice or millets like jowar and bajra are, indeed, a must for you. So are the pulses or *dals*. What will your mother do to cook your food with, had there been no oil-seeds at all? Your morning breakfast may not be the same in the absence of beverages like tea or coffee, of course, added with sugar to your taste. Do you think your food would be complete without fruits and vegetables? Where do these cereals, pulses, oil-seeds, beverages, vegetables and fruits come from? We obtain all these things directly from the soil.

Then there are a few more items of our food like milk and meat It is true that we do not obtain these animal products directly from the soil. But the animals that give us milk and meat largely sustain on grasses which, in turn, come from the soil and nothing else. Therefore, it should be correct to say that ultimately even these food items. we derive, indirectly though, from the soil itself.

The products like cereals, vegetables etc. which we obtain directly from the soil are termed *primary food products*. Those that are derived indirectly are referred to as *secondary food products*. All our food, be it primary or secondary, thus comes from the soil, and soil alone. But the soil is our prime resource not only because it provides all our food but also because it is the only source for many more things.

The wood we use for fuel or as timber is a primary product of the soil. So are tobacco and rubber. Whereas plant fibres like cotton, jute and sisal are the primary products of the soil, the animal fibres like silk and wool fall under the category of secondary products of the soil. Thus the basic elements of our food, clothing and even shelter to a large extent, are obtained only from the soil, which indeed is our prime resource.

The art of cultivating soil, raising crops and trees and rearing animals is known as *agriculture*. With the tremendous growth of knowledge, agriculture has now become a science by itself. In this chapter we shall study some important facts about soils, our forests, wild life and livestock. The next chapter will deal with crops that we raise from the soil.

Agriculture in India coccupies a special place. Nearly 70 per cent of our population is engaged in agriculture. About 45 per cent of our national income is accounted for by agriculture alone. It forms the backbone of our country's economy. The key to our steady

and all-sided prosperity lies in the systematic progress of our agriculture.

Major Soil Types

Soil as you know is the loose rock material containing the remains of plants and animals. This organic matter present in the soil is known as humus. Forming as it does the uppermost layer of the earth's crust, it serves as a source of food and moisture for plants. The nature and quality of soil depend upon a number of factors. Important among them are: rock from which soil is derived, relief of the land, natural vegetation and climatic conditions with which soils are associated. In other words, we in India should expect a large variety of soils. If we want to confine ourselves to only a few very broad types we have alluvial soils, black soils, red soils and laterite soils.

Alluvial soils are generally made up of fine silt brought down by rivers from mountainous regions. Very fine and relatively new alluvium is found in the flood-plains and the deltas. It is locally known as *khadar* and is most fertile. Soils that are relatively old and coarse are known as *bangar*. They lie on the piedmont plains or on the upper sides of the river valleys. These are slightly less fertile than *khadar* soils. These fertile alluvial soils are found in the Great Northern Plains of India and in the deltas of the rivers in peninsular India.

Black soils are common in the Deccan Trap region, and are made up of volcanic rocks or lava flows. They are generally found in the hot and relatively dry regions. These fertile soils are clayey. They retain moisture for a long period. These soils are mainly found in Maharashtra and parts of Madhya Pradesh and Gujarat. As they are most suited for raising cotton crops they are also known as black cotton soils. Locally they are known as *regur* soils.

Red soils are generally developed on crystalline igneous rocks in the hot and relatively dry parts of the southern and eastern parts of the Indian peninsula. They are relatively less fertile, but are capable of growing good crops with the help of fertilizers.

Laterite soils are typical of hot rainy climates of the hilly regions of the Western Ghats and the Chhota Nagpur Plateau. Heavy rains wash away the fertile part of the soil dissolved in water. This process is known as *leaching*.

In addition to these, there are a variety of mountain soils found in the Himalayan region. The arid sandy soils are confined to West Rajasthan. These desert soils also include the wind-blown loess. This large variety of soils in India partly ensures a very wide range of crops. Also it allows and calls for a proper use of land according to its suitability from place to place.

Land Use

As you know the prosperity of the people largely depends upon how wisely they use the land they possess. The proper use of the land depends upon the depth, nature and fertility of the soil, relief of the land, climatic conditions, adequate supply of water on time for irrigation and the drainage of surplus water. All these facts together determine the best possible use of every piece or strip of land in the country.

Let us find out the broad pattern of land use in our country. Slightly less than 19 per cent of our total land area is left under forests. A little less than 5 per cent is all that we have been able to leave under permanent pastures. About 16 per cent of the land is either a total waste land or built up area. This leaves a balance of 60 per cent of the total land area, from which as much as 55 per cent has already been brought under the plough. Thus not more than another 5 per cent of the land can be brought under agriculture, of course with great effort.

This marginal land is poor and would require large investment to make it economically productive.

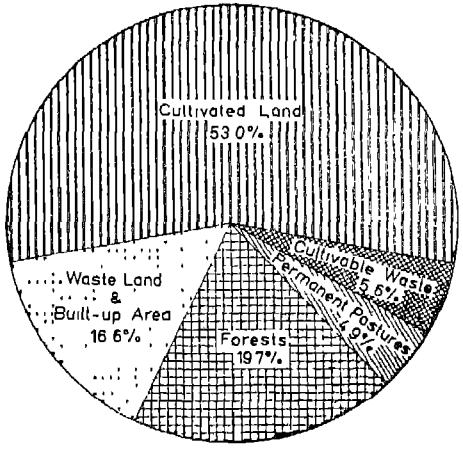


FIG. 25. *Land Use in India*

Note that India has very little land under permanent pastures. Why should it be so?

Land Under Forests

India has hardly 19 per cent of its land area under forests. For the balanced development of a country it has been found that it should have at least one-fourth of its area under forests. Forests are *beneficial* to us in ways more than one. Confining themselves to hilly and uneven areas, they provide us with fuel and timber. When properly looked after they become a permanent or a perennial source of these resources.

Forest trees growing in rocky and stony soils help to develop fertile soils, of course very gradually. They supply the necessary humus content to these new or developing soils. Roots of the trees, the thick undergrowth and grasses together help to conserve soil and water in the rainy and very uneven areas. In their absence it is these areas that suffer most in terms of soil erosion. Forests also help in checking floods by holding a considerable amount of rain-water in the

sub-soil. They also help to a certain extent in increasing the rainfall.

Yet another important advantage of forests is that they offer the necessary food and seclusion for wild life.

Our Forest Wealth

The forestland in India is big enough to cover the total area of France and Switzerland put together. Nearly three-fourths of our forests are suitable for commercial exploitation. The bulk of the forest land is under deciduous trees, leaving only 5 per cent under coniferous ones.

The forest wealth is generally divided into two categories, major products and minor products. Wood that we obtain from the forest forms the major product. It is used either as fuel or as timber. The coniferous forests found in the Himalayan region have several useful species of trees. They include pine, spruce, silver fir and deodar. These trees constitute the largest source of softwood in the country. It is used as timber for building houses, making furniture and manufacturing boxes for packing purposes. The wood of these softwood trees is also used for manufacturing woodpulp. It is used for making paper, newsprint and cellulose.

Sal and teak are the two most important species which belong to the deciduous or the monsoon forests of our country. They are widely used as timber, since their wood is fairly hard and durable. The sal tree is more widespread and found in North and Central India. Teak forests mostly occur in the Western Ghats and in the Satpura ranges of Madhya Pradesh. The other important trees of our forests are bamboos, mohagani, rosewood and sandalwood. Bamboos are now-a-days used for making pulp which in turn is used for manufacturing paper and newsprint. Rosewood is used for making furniture and decorative pieces of wood carvings. Sandalwood is also

used for decorative purposes with an added advantage of its fine scent. This prized wood comes from the forests of the Nilgiri Hills of the Mysore State.

Our forests provide a large number of minor products. They include lac, resins, gums, medicinal herbs, *katha*, fodder, grass, and leaves for making *bidis*. Charcoal is also obtained from the forest wood. *Russa* and *khus* grasses are also used for extracting essence. The sandal and other essential oils are one of our foreign exchange earners. Material used for tanning leather is also derived from our forests. *Katha* is obtained from the *khair* trees by boiling their chips. Resins which are generally obtained from the coniferous trees, mainly the chir, are used for making turpentine. Lac is the secretion of an insect living on the sap of certain trees like *palash* and *khusum*. These trees are chiefly found in the States of Bihar and Madhya Pradesh. Lac is in great demand both in India and abroad. We are the largest supplier of lac in the world market. You must have seen seals made out of lac or shellac. It is also used in making bangles, gramophone records and electrical instruments.

Forests play an important role in the economy of our country. It is like a proverbial hen laying golden eggs. It is, therefore, necessary to take care of our forests on scientific lines. In order to maintain a steady supply of wood for fuel and timber and other minor products, we have to see that we plant more trees every year than what we fell. The Central and State Governments have well trained staff to look after our forests. The Forest Research Institute of Dehra Dun has been doing very useful work in training our forest personnel and conducting research in order to make our forests more and more productive.

Wild Life

Various kinds of wild animals and birds are found in the Indian

forests. Important among them are the elephants, tigers, leopards, cheetas, rhinoceros and the lions of the Gir forests in Saurashtra. Deer and antelope are also common in most part of the country. The peacock with its beautiful plumage has now been declared the national bird of our country.

The wild life of our country is indeed our national asset. Thousands of tourists from other countries visit India to "shoot" these animals with their cameras. We are able to see these animals and watch some of their habits in a zoo where they are kept for our benefit. In order to preserve wild life in its natural setting, the Central and the State Governments have established national parks. *National park,* as you know, is a reserved area meant for preserving its natural vegetation, natural beauty and its wild life. They are thus much different from a zoo.

It is the duty of every citizen to preserve wild life. This is very necessary because a large number of species of birds and animals have already become extinct in our country. Clearing of forests and wreckless hunting of animals on the part of man for his immediate and personal gain has been mainly responsible for this tragic state of affairs. At present the rhinoceros, the Indian cheeta, lion and the Indian great bustard are found only in very small numbers. Let us hope that we shall be wise enough to preserve these precious assets of our country.

We in India observe Wild Life Week in the first week of October which coincides with the birth anniversary of Mahatma Gandhi.

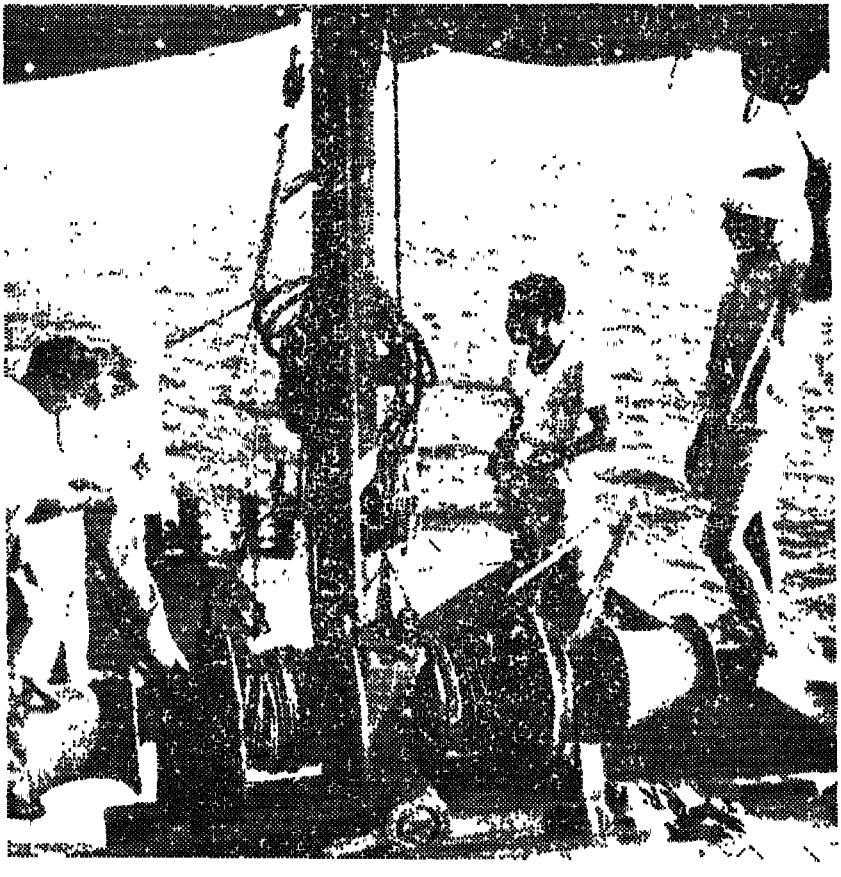
Fish are not directly related to the soil. But they form an important part of wild life. You would, therefore, like to know something about our fisheries as well.

India with its long coastline has access to wide fishing areas. The most common varieties of fish found in Indian waters are herring, sardine, tuna, Indian salmon, mackerel and shark. Both the Arabian

Sea and the Bay of Bengal are rich in fish because the ocean currents and numerous rivers joining the sea provide ample food for the fish. Our fishermen are also adventurous. With modern fishing boats, better fishing nets and increased cold storage facilities, the annual catch of fish has been steadily rising. More than a million tonnes of fish are caught in our seas every year. Some of the Indian varieties of fish are popular abroad and, therefore, offer much scope for earning foreign exchange.

XVII. An Indian Trawler on the High Seas

This modern fishing trawler of the coast of Kerala points out to us that we can increase the fish catch considerably. Why do we need to increase the fish catch?



In India inland fishing is also becoming more and more popular. The Government have taken steps to stock our rivers, tanks, reservoirs, lakes etc. with suitable and better varieties of fish. In fact in view of the shortage of proteins in our diet, India has to depend more and more on fish to overcome this deficiency.

Land Under Pastures

India has only five per cent of its total land area under pastures. This is extremely low, particularly when it claims the largest number of cattle in the world.

The pasture land is widely scattered all over the country. In certain parts the villagers themselves have been managing and looking after the pasture lands as a common cooperative undertaking. They protect the pastures till the grass is fully grown. Then they harvest it and distribute it among themselves in proportion to the land they actually till. This cooperative management of the village pastures has been in vogue for a pretty long time.

Our Animal Wealth

India possesses 175 million heads of cattle. This means that nearly one-fifth of the world's cattle is found in India. There are seventy-two million bulls which are mainly used for working on the farms as draught animals. The number of milching cows in India is about fifty-four million and the rest of the cattle consist of the young ones. India possesses about fifty-one million buffaloes. It nearly accounts for half the world's total. Of this nearly fifty per cent are milch animals, and account for the bulk of the milk production in India. Punjab, Haryana, Delhi, western Uttar Pradesh, and Gujarat have some of the best milch buffaloes and cows in India.

India has about 40 million sheep. Only a small percentage of these yield quality wool. They are reared mainly in the Western

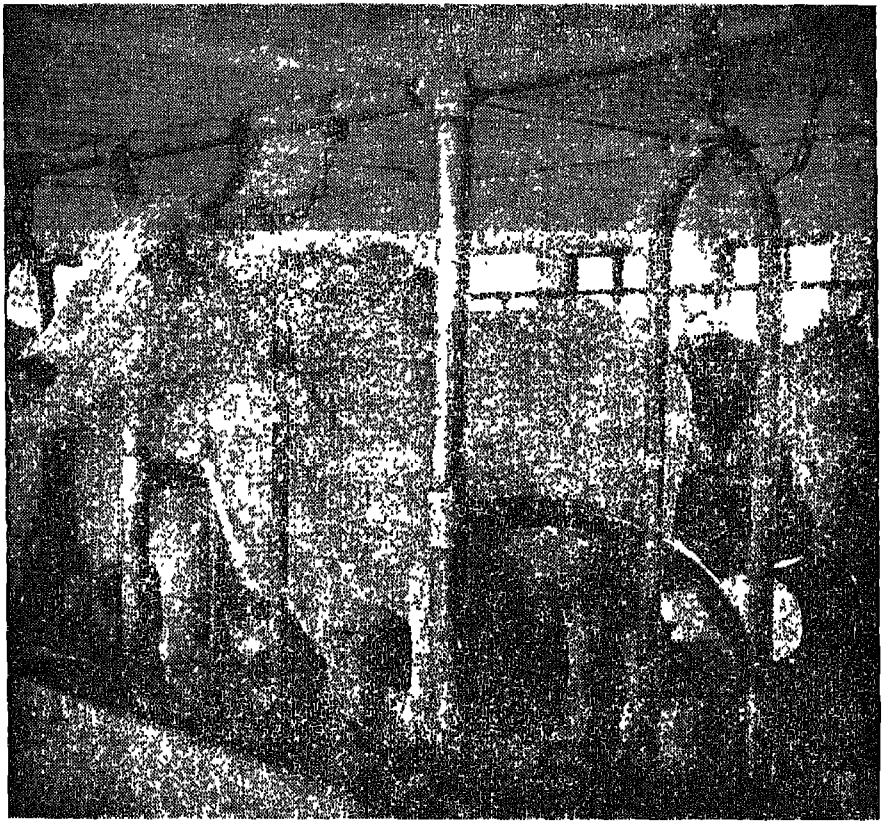
Himalayan region—Jammu and Kashmir and Himachal Pradesh.

There are about sixty million goats in India. This is about one-sixth the world's total. A goat is often called a poor man's cow. The rest of the live-stock consists of horses, mules, donkeys, camels, pigs and yaks.

It is obvious that such a large number of animals in India cannot be supported by a mere 5 per cent of its pasture land. Most of these

XVIII. Dairy Cows from Haryana

Haryana cows are among the best breeds of dairy cattle in India. Compare this breed of cow with that of South Devon from Britain.



animals are reared on the farmlands. These animals are supported mostly on the fodder produced on the farms. They consume fodder in large quantities and return valuable manures to the land These manures have helped to maintain the fertility of the soils. Unfortunately many a farmer consumed cow-dung as a cheap source of fuel. Now some of the progressive farmers have shown that the cow-dung can be used both as a fuel and as a manure. It is used as a raw material for producing gas which serves as a cheap and handy fuel. This is done before the dung is applied as a manure in the field.

India, because of its huge animal wealth, can export hides and skins bringing in return valuable foreign exchange. Wool is used for making woollen cloth. The rugs and carpets made out of the wool are also exported on a large scale.

Although India possesses a variety of live-stock in a very huge number, the quality of the most of its animals is far from satisfactory. We have great affection for our animals but we do not take care of them on scientific lines, as the people in advanced countries do. Now we also want to improve the quality of our animals so that we have an adequate supply of milk, mutton, chicken, eggs etc. With this end in view, special breeds of cattle, buffaloes, sheep and poultry are being developed in our country. *Gosadans* or *Goshalas* are also maintained. India has yet to make tremendous progress in the development of our animal wealth in order to improve the quality of the diet of our people and meet their several other requirements.

THE NEW TERMS YOU HAVE LEARNT: *Primary Food Products*—The products like cereals, fruits, vegetables which we obtain directly from the soil. *Secondary Food Products*—The products like milk, eggs and meat which are derived indirectly from the soil. *Leaching*—The process by which fertile soluble part of the soil is dissolved and carried away by water.

EXERCISES

Review Questions

1. Answer the following questions:
   (i) Name five primary products of soil.
   (ii) What is humus?
   (iii) What is the difference between *khadar* and *bangar* soils?
   (iv) What is leaching?

2. Distinguish between:
(a) Primary food products and secondary food products.
(b) A zoo and a national park.
(c) Milch animals and draught animals.
(d) Live-stock and wild life.

3. Explain what is soil and how it is formed. What are the major types of soils in India? How is soil conserved and its fertility maintained?

4. Write an essay of about 20 lines on the forest wealth of India. Cover the following points: (i) Area under forests (ii) Types of forests and (iii) Major forest products.

5. Why is wild life very important? How can we help in preserving our wild-life?

Map Work

6. On an outline map of India show the following:
   (i) areas of coniferous forests
   (ii) areas of quality sheep
   (iii) areas of teak and ivory
   (iv) areas of fine breeds of milch cows and buffaloes.

Topic for Class Discussion

7. *Our Animal Wealth*

Let the class collect information and figures regarding our live-stock. Then they may discuss why the average yield of milk is so low in our country. Finally, they may find out and report to the class what steps are being taken to improve this situation.

13

The Soil—Our Prime Resource (II)

THE TERMS YOU ALREADY KNOW: *Cash Crops*—Crops grown by the farmer not for his own consumption but mainly for the cash they bring him on sale. *Rotation of Crops*—Different crops that are grown one after the other on the same piece of land, mainly with a view to restoring fertility of soil.

INDIA is fortunate enough to possess rich agricultural resources. They include a wide variety of fertile soils, ample water for irrigation and a growing season almost all the year round. The variety of soils and variations in climatic conditions from region to region make it possible to grow a large number of crops in our country.

India occupies an outstanding position in the world in several agricultural products. It stands first in the production of tea, sugarcane, millets, groundnuts, sesame and mustard. It stands second in the production of rice, jute and jowar. It is also an important producer of tobacco, linseeds, wheat and cotton.

As you know we have already brought nearly 55 per cent of the total land area under the plough. Of this nearly 47 per cent of the total land area is actually under crops every year. The remaining 8 per cent land is brought under crops only once in two or three years. The rest of the period it is left *fallow* in order to restore its fertility.

Thus, we have really no more land to bring under the plough. We need to use our existing arable land more intensively. Then alone we may be able to grow enough food and other agricultural raw materials for our exceptionally large population increasing further at a much rapid pace.

In India 84 per cent of the total land area under cultivation is devoted to food crops; and yet the country is not self-sufficient in its food requirements. Although 70 per cent of the population is engaged in agriculture, we are unable to produce enough food to feed the remaining 30 per cent. With such a large proportion of people working in the farms, forests and fisheries, the total value of the entire agricultural produce should be just 45 per cent! This indicates the unsatisfactory state of our agriculture.

Thus Indian agriculture although employs a lot of manual labour, it is predominantly a *subsistence* type. The subsistence type of agriculture is one in which a farmer consumes almost everything what he produces on his farm, leaving very little of his produce for marketing.

Crops have been raised year after year. As a result in many cases soils have been impoverished or exhausted. Reckless clearing of forests, overgrazing and occasional heavy downpours have led to extensive soil erosion. The constant growth of population has led to fragmentation of agricultural land. Very small size of land holdings often makes them uneconomic.

Agricultural yields in our country are among the lowest in the world. The methods of farming are outdated. Little use is made of modern chemical fertilizers. The seeds used are generally poor. Marketing facilities for selling agricultural produce are very limited. There are no good roads in rural areas. There is no security for the farmers against failure of crops.

Since Independence efforts are being made to bring improve-

ments in Indian agriculture. More and more irrigation facilities are provided. In many parts of the country electricity is now supplied to the farms as well. The use of manures and fertilizers is being encouraged. The government have set up demonstration farms to propagate use of new farming methods and implements. The government have succeeded in developing new seeds which are responsible for considerably high yields. The prices of agricultural crops have also been raised; and the farmer is assured of the minimum price which would be found attractive by him to invest money in raising crops. Loans are also made available to farmers through banks and cooperative societies to construct wells and purchase water-pumps, tractors and other machinery. Arrangements are made to protect crops from pests and diseases. A few large mechanised farms have been set up by the government for demonstration purposes. The Suratgarh Farm in Rajasthan is a well-known example of this kind. Special rural programmes are arranged on radio for the benefit of farmers. All this has resulted in raising the agricultural production in many parts of our country. In certain parts of the country, especially in Punjab and Haryana, the yields of crops like wheat have been considerably increased. This recent break through in Indian agriculture is often referred to as *Green Revolution.*

Agricultural Seasons

Agricultural operations in India begin with the arrival of the monsoons in June. There are two agricultural seasons—*kharif* and *rabi.* The kharif season begins with the onset of the monsoons. The important *kharif* crops are rice, millets, maize, jute and cotton. These crops are harvested in autumn. The *rabi* season begins in autumn after the rains, and crops are harvested in spring. The important *rabi* crops are wheat, gram, barley, linseeds and mustard.

Major Cereal Crops

Rice is the leading food crop of India. Our country stands next only to China in the production of rice.

Rice requires uniformly high temperature and an assured rainfall of about 100 to 200 centimetres. The rice plant does well in clayey soils since it requires standing water during its period of growth.

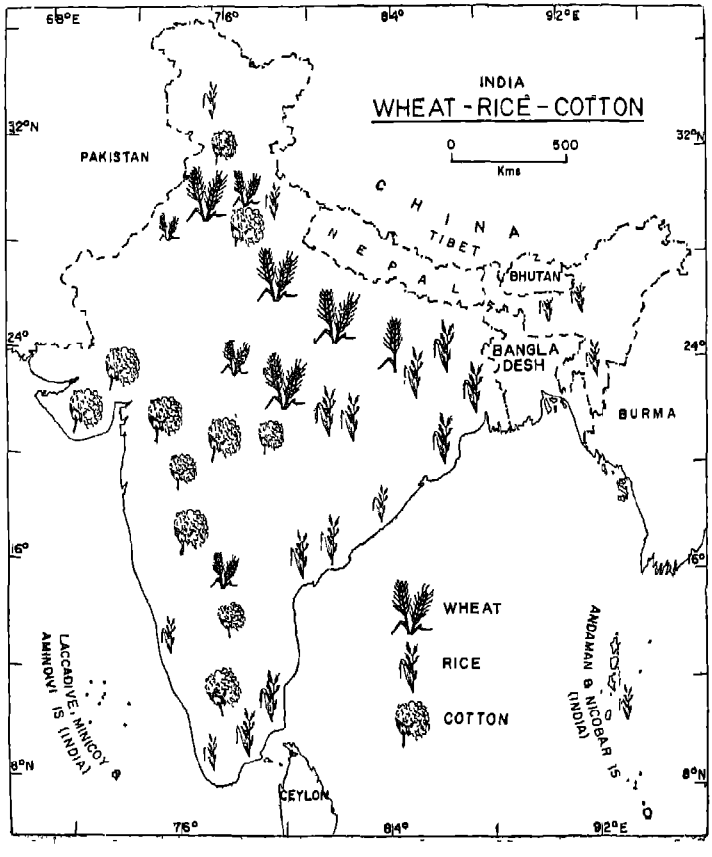


FIG. 26 *India—Areas Producing Rice, Wheat and Cotton*

Note the areas which produce rice, wheat and cotton. Can you name these areas?

The territorial waters of India extend into the sea to a distance of twelve nautical miles measured from the appropriate base line

As a result, rice fields in the plains are always properly bunded. Along the hill slopes they are terraced so that they may be able to hold water. Rice is a staple food of the coastal strips of India, West Bengal, Assam, Bihar and the eastern parts of both Uttar Pradesh and Madhya Pradesh. It is also grown in the valley of Kashmir and in the irrigated parts of Himachal Pradesh, Punjab and Haryana. The deltas of the Cauvery and Krishna raise two to three crops a year, whereas in many other areas rice is grown as a *kharif* crop only during the rainy season.

Wheat is the second important food grain of India. Unlike rice it is a *rabi* or a winter crop grown in well-drained soils. It requires rains during early period of its growth. At the time of ripening, the grain requires warm and sunny weather. In India it is generally grown in the north-western parts of the country that is Punjab, Haryana and Western Uttar Pradesh where the winters are relatively long and somewhat wet. Wheat is also grown on the Malwa Plateau, the parts of the Deccan Plateau and in the plains of Gujarat and Rajasthan. As a result of the new hybrid variety of wheat plant, the yield and the production of wheat has substantially increased in the states of Punjab and Haryana.

Millets: *Ragi*, *Jowar* and *Bajra* are the three important millets or the coarse grains grown in the areas where rice cannot be grown because of inadequate rainfall. It is an important crop of the Mysore Plateau. *Jowar* requires less rainfall than ragi and is grown on the Deccan Plateau in the parts of Mysore, Maharashtra and Madhya Pradesh. *Bajra* is grown in those parts where rainfall is still less. It is grown in parts of Maharashtra, Gujarat, Madhya Pradesh, Rajasthan, Uttar Pradesh and Haryana. The yield of these millets has been steadily increasing with the expansion of irrigation facilities and the development of new and high yielding varieties,

Maize is a high yielding food crop. It grows well in an area with a moderate rainfall and high temperature. It is grown in Uttar Pradesh, Rajasthan, Punjab and Bihar.

Pulses and Oilseeds

Pulses such as gram, *arhar*, lentil (*masur*), black gram (*urd*), *moong* and peas are an important source of protein. They are particularly necessary for those who do not eat meat. They are grown almost all over India, except the areas with heavy rainfall. Pulses are leguminous plants which help to restore fertility of the soil in which they are grown. They play an important part in rotation of crops.

Oilseeds: India is one of the leading oilseeds producing countries of the world. The chief oilseeds grown in India are groundnut, sesame, mustard, linseeds and castorseeds.

Groundnuts are extensively grown in the red soils of South India and also in the parts of Gujarat and Maharashtra. Groundnut oil is used in cooking and also in manufacturing vegetable ghee or *vanaspati*. Its cake which is left after extracting oil is a good feed for dairy cattle and is also used as manure for soil. However, groundnut has a great demand abroad and large quantities are exported for earning valuable foreign exchange.

Linseed oil is used as edible oil and also for the manufacturing paints, varnishes etc. Copra obtained from coconuts is yet another source of oil in India. Coconuts are grown on the coastal strips particularly in Kerala on a very large scale. Mustard is grown in the wheat producing regions and is widely used for cooking in Northern India.

Sugarcane

Sugarcane is a kind of grass with a thick stem. Its homeland is believed to be India, the largest producer of sugarcane in the

world. Sugarcane plant needs high temperature, plenty of irrigation water and well-drained fertile soil.

Although sugarcane is grown in several parts of India, it mostly comes from the irrigated lands of Uttar Pradesh, Punjab, Haryana and Bihar. Nearly half of the total production of sugarcane comes from Uttar Pradesh alone. The other producers are Maharashtra, Mysore, Tamil Nadu and Andhra Pradesh. Although the area under

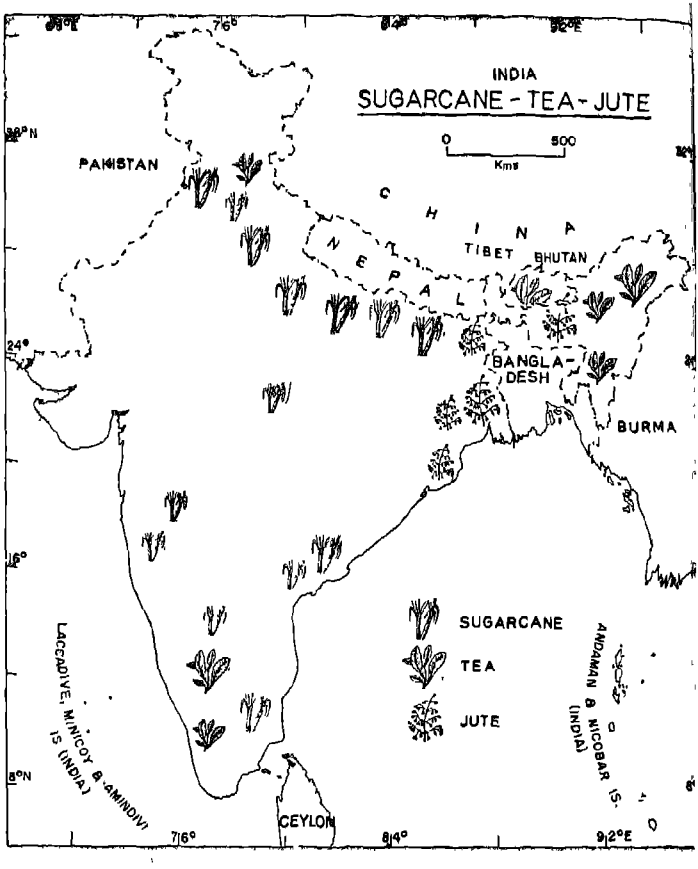


FIG 27. *India—Areas Producing Sugarcane, Tea and Jute*

Note the concentration of tea and jute in Assam and West Bengal respectively How will you explain this? What makes Uttar Pradesh the largest producer of sugarcane?

The territorial waters of India extend into the sea to a distance of twelve nautical miles measured from the appropriate base line.

sugarcane is less in the southern states, the yield of sugarcane per hectare in these states is much higher. In our country sugarcane is used for manufacturing *gur*, *khandsari* and sugar.

New varieties of sugarcane have been developed at the research station at Coimbatore.

Tea

India is the leading producer of tea followed by Ceylon and China. It is a plantation crop and grows well in deep fertile and well-drained soils. Also necessary for its growth are a warm and moist

XIX. A Tea Garden in Himachal Pradesh

Look at the women and children busy at picking tea leaves Which two states in India have virtual monopoly of tea?

climate, and a rainfall of over 200 centimetres well distributed throughout the year.

Tea gardens are confined to the valleys of the Brahmaputra and the Surma in Assam extending towards the hills. Tea is also grown in northern Bengal and along the slopes of Nilgiri Hills in the south. India is the leading exporter of tea rivalled only by Ceylon. We are able to earn a good deal of foreign exchange through the export of tea.

Coffee

Coffee is the second most popular beverage of India. A coffee plant requires rich well-drained soil, warm climate and moderate supply of moisture. It grows best in the tropical highlands. In India its production is confined to the state of Mysore followed by Kerala and Tamil Nadu. The quality of Indian coffee is very good and is, therefore, in good demand even outside India. We export nearly half of our production every year.

Spices

India has been well-known throughout its history for the spices it produces. It produces black pepper, chillies, ginger and cardamom. The spices are generally grown in the areas having constantly high temperature and a very heavy rainfall. In India the production of spices is confined mainly to the Malabar coast of the states of Kerala and Mysore.

Fruits and Nuts

India produces a wide variety of fruit. Mango is by far the most important fruit of India and is very widely grown. The delicious varieties of alfanso locally known as *hapus* from Goa and Konkan and the *dasehri* from Uttar Pradesh are exported because of their high quality. India also produces bananas, oranges, pineapples and

coconuts which are essentially tropical fruits.

Cashewnuts are grown in Kerala and the coastal belt of the Mysore State. The nuts are roasted and their shells are carefully broken up maintaining the kernel intact. This delicate job is done with great deftness by the women workers of the west coast. India has been exporting more and more cashewnuts to other countries earning a good deal of foreign exchange in return. However, it has to depend upon imported raw cashewnuts.

Our country also produces fruits like apples, plums, almonds, apricots, peaches, pears and cherries which are essentially the fruits of the temperate climate. They are mostly grown in the valleys of Kashmir, Kulu and Kangra and in the Kumaun hills.

Cotton

Cotton, the king among the fibres, is perhaps the most important cash crop of India. It is a *kharif* crop. A cotton plant does well in the black cotton soil of the Deccan Plateau. It requires hot climate and sufficient rainfall during the growing period. However, it requires sunny and dust-free weather when the balls ripen and are ready for picking. Most of the cotton grown in India is of the short and medium staple variety. The long staple crop is now grown in parts of Punjab and Haryana. The major producers of cotton in India are Maharashtra and Gujarat followed by Punjab, Mysore, Tamil Nadu and Madhya Pradesh. The yield of cotton in our country is still very low.

Jute

Jute, another plant-fibre, occupies a very important position in our country's economy. Being an important foreign exchange earner, it is often called the 'Golden Fibre' of India. Jute plant needs hot climate, plenty of water and rich soils that need to be continu-

ally renewed. As a result, the cultivation of jute in India is concentrated mainly in the delta of the Ganga in West Bengal. Immediately after partition, India was producing very little jute to meet the requirements of its jute mills located around Calcutta. Since then we have made considerable progress in raising the production of jute and becoming self-sufficient in this regard. In our exports of jute goods we may have to face a very stiff competition from Bangla Desh which is more favourably situated in regard to the production of quality jute. Cooperation and not competition would be in the interest of both.

Tobacco

Tobacco is yet another non-food cash crop of India. We stand next only to the United States in the production of tobacco. In India, Andhra Pradesh is the leading producer of tobacco. The other states in which it is grown are Gujarat, Tamil Nadu and Mysore.

XX. A Rubber Estate in Kerala

Look at the women tapping rubber trees and collecting latex. Note the big grass hat worn by a woman worker. What type of climate does it indicate?

Rubber

Rubber is an important industrial raw material. It is grown in India almost exclusively in Kerala. Natural rubber is obtained from the latex of a rubber tree. This plant grows well in areas having a hot climate and heavy rainfall well distributed throughout the year. We use all our rubber in the manufacture of tyres and tubes.

Now you would realise how much we owe to our soil in meeting our various requirements. Soil provides us not only the food but also the industrial raw materials like wood, rubber, tobacco, cotton, jute and sugarcane. In fact, many of our industries like the textiles and sugar will be directly affected if agricultural production does not maintain a steady progress.

THE NEW TERM YOU HAVE LEARNT: *Green Revolution*—Recent developments in agriculture in our country which have led to a considerable increase in agricultural yields of certain cereals mainly as a result of new seeds, application of manures and chemical fertilizers, and the provision of an assured water supply.

EXERCISES

Review Questions

1. Answer the following questions:
   (i) Name the two most important cereals of India.
   (ii) What are the three important millets grown in our country?
   (iii) What is a cash crop? Name three cash crops of India.
   (iv) Which is the most important plantation crop of our country?

2. Distinguish between:
   (i) A cash crop and a plantation crop.
   (ii) Commercial agriculture and subsistence agriculture.

3. Use a single technical term for each of the following:
   (i) Crops sown soon after the onset of the monsoons and harvested in autumn in our country.
   (ii) Crops sown in autumn after the rains and harvested in spring or early summer.
   (iii) The land that has already been brought under the plough but periodically left uncultivated for restoring its fertility.
   (iv) One-crop farming on scientific and commercial lines resembling factory production.
4. Describe the conditions of soil and climate required for growing rice, wheat and cotton.
5. State various steps taken since Independence to improve Indian agriculture.

Map Work

6. On an outline map of India show the areas producing rice, wheat, tea and cotton.

Topic for Class Discussion

7. *Items of our Daily Diet and Wherefrom Do They Come?*

Let the students list various items of their daily diet including breakfast. Then they may find out where they were originally produced. Finally, they may draw conclusions with regard to the interdependence of various parts of the country.

14

Our Water Resources

THE TERMS YOU ALREADY KNOW: *River Basin*—A large area drained by a single river and its tributaries. *Reservoir*—A large artificial lake created by building a dam across a valley for storing water for irrigation and other purposes.

IT is not too much to say that water is life. As you know, it is the presence of water that makes all the difference between the earth and the rest of its sister planets. You may recall that our earth is often called '*a watery planet*' since the major portion of the earth's surface is covered with oceans. However, it is through the natural processes of *evaporation*, *condensation* and *precipitation* that we derive all our sweet or fresh water. In India the most productive use of fresh water lies in irrigating our farms for raising more and more crops.

The Need for Irrigation

India has already a huge population of about 547 million people. Moreover, it has been increasing at a very rapid pace. Therefore, we have pinned down all our hopes on increasing irrigation facilities to produce enough food for our evergrowing population. India already stands next only to China in its total irrigated area. Yet

the need for bringing more and more land under irrigation is almost never ending. This is because there is hardly any land that can be brought hereafter under the plough.

Higher yields of crops are made possible through timely and adequate supply of water. The use of fertilizers also helps in this regard, provided the irrigation water is readily available. Above all, irrigation helps us in raising more than one crop from the same piece of land.

Nearly one-tenth of the total area of our country receives a rainfall of over 200 centimetres per annum. On the other hand, a third of its total area receives a rainfall ranging between 0 and 75 centimetres a year. In other words, several parts of the country have to put up with heavy downpours, not knowing what to do with this 'too much' of rain water. As a result these and several other adjoining parts of the country often suffer from devastating floods. At the same time there are vast areas which receive 'too little' rainfall to raise any crops.

The distribution of rainfall over a year in our land is equally uneven. Nearly three-fourths of the total annual precipitation is concentrated in a short period of just three to four months in a year.

The figures of the average annual rainfall in many parts of our country are often meaningless. It is due to a lot of variation in the total amount of rainfall from year to year. Thus the monsoons are highly erratic and are far from reliable. As a result famine conditions in one part of the country or the other are not very uncommon.

Furthermore, we live in that part of the world where the rate of evaporation of water is very high. This is more so because the bulk of the rainfall in our country is confined to a few summer months.

Thus it becomes imperative on our part to make an intelligent use of our rain water, in order to irrigate our fields. You will see that

all our means of irrigation, namely tanks, wells and canals, are geared towards this sole objective. With great effort we have now been able to bring nearly one-fifth of our total cultivated land under irrigation.

Sources of Irrigation

Tanks: Since olden days it has been a common practice to store rain water in natural hollows where rain water is automatically collected. They are called *tanks*. The rain water thus collected from the surrounding areas is then used during a dry period when the water for crops is in great demand. Tanks also help in raising the underground water level of the wells in the neighbouring areas. Thus tanks have been one of the important sources of irrigation in our land. Tank irrigation even today accounts for nearly 20 per cent of the total irrigated area in our country. They are particularly common in the south, especially in Andhra Pradesh and Tamil Nadu where the land is rocky and uneven.

Wells: As you know, not all the rain water is carried away by streams or rivers. A considerable part of it manages to seep into the ground. Water which is thus stored up in the ground is called *ground water* or sub-soil water. Since early times we have been using the ground water drawn from the wells for drinking, as well as for irrigation. There are two types of wells—*kucha* and *pucca*. A pucca well is one which is lined with bricks or stone.

Various mechanical devices like the pulley, wheel, and lever have been in use to draw water from wells. Nowadays pumping sets working with the help of mineral oil or electricity have become fairly common on our wells.

Tube Wells: So far we were using only the well water which was in easy reach as it was not very deep from the surface. Now with the growing use of electricity in our countryside it has been pos-

sible for us to tap even bigger reserves of sub-soil water available at considerable depth. A very deep bore is dug into the earth with a drilling machine and water is drawn out with the help of electricity. Such deep bore wells worked with electricity are known as *tube wells*.

The tube wells have now become most common in the alluvial plains of Punjab, Haryana, Uttar Pradesh and Bihar. In this area there are huge water reserves at great depths and the need for irrigation is also considerable. These tube wells have proved very useful to our farmers since they ensure a timely and an assured supply of water. Generally these wells are least affected by the variations in or failure of rainfall.

Wells in our country still account for a little more than thirty per cent of the total irrigated area. Uttar Pradesh, followed by several other states, leads in well irrigation.

Canals: Yet another source of irrigation is the river water. In many parts of the country water of the streams, rivulets or rivers is impounded in an artificial lake by constructing a small dam across the river-bed. The water thus stored is diverted to the fields through small channels called canals. Such local canals have been in use in our country since long.

Besides these local canals there are some seasonal canals, although on a big scale. During high floods water rising above a certain level is diverted through canals. These canals utilizing flood waters are known as *inundation canals*, where the word inundation stands for flood. These canals are useful for controlling floods. They are useful for irrigation only during the rainy season. Even so they have been found useful in the arid parts of northwest India, where rainfall is very uncertain.

More important are the *diversion canals* as they are *perennial* in nature. They are taken out from the main river by constructing

a small weir across the river.

Major Canals

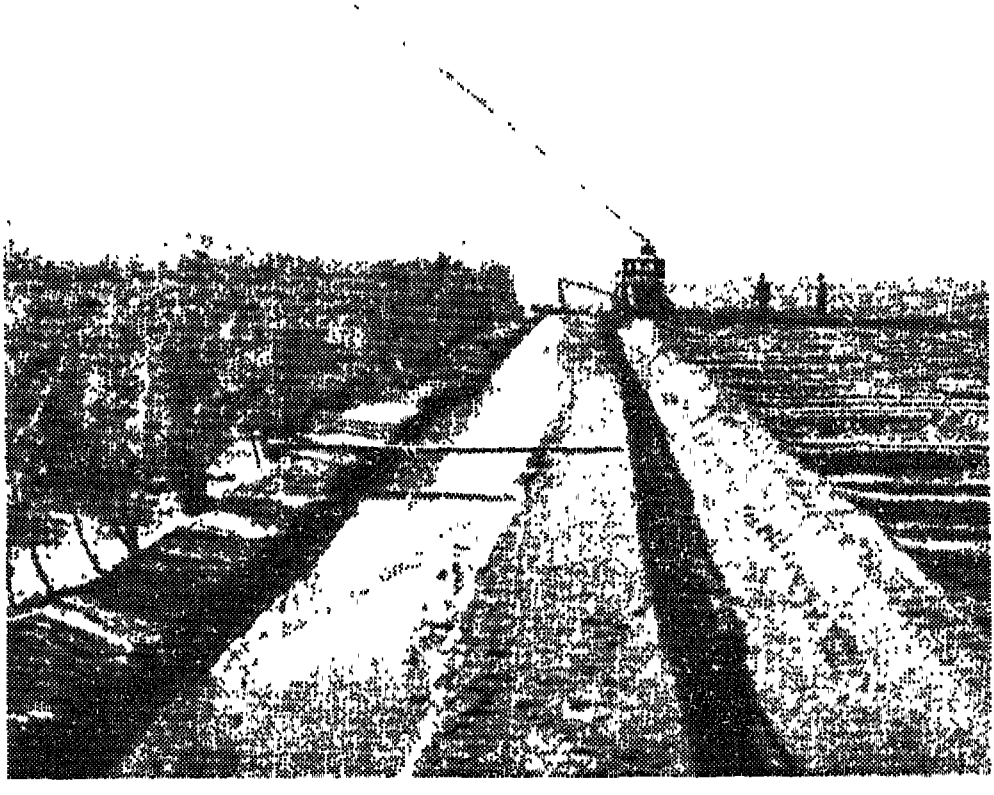
Before Independence, undivided India had the world's best network of irrigation canals. After partition the major portion of this intricate network went to Pakistan. Since then we have been able to rebuild our own canal system in Punjab and Haryana. Today it is the most closely knit irrigation canal system of our country. Western Uttar Pradesh is also well-served by canal irrigation.

In the states of Punjab and Haryana the important canals are Western Yamuna Canal, the Sirhind Canal and the Upper Bari Doab Canal. In Uttar Pradesh they are the Upper Ganga Canal, Lower Ganga Canal, Eastern Yamuna Canal, Agra Canal and Sharda Canal.

The canals are also important in the deltas of the Godavari, Krishna and Cauvery. The Periyar river, rising in the Cardamom Hills, drains into the Arabian Sea after flowing through Kerala. The waters of this west flowing river have been impounded and taken to the eastern part of the Ghats through a tunnel. It thus irrigates the flat areas around Madurai where the soils are also fertile. The Mettur Dam across the Cauvery supplies water to the canals in the delta region. The network of canals in the Cauvery delta is one of the oldest and the largest in India.

Managing Our Water Resources

In our country the lack of irrigation water in certain areas and the need to control floods in others are the real problems. These two problems are interconnected. They cannot be tackled or solved merely on the local level. In fact, their best solution lies in working at the inter-state or national level. If you glance at the map of India, you will find that none of our major rivers is confined to



XXI A New Method of Irrigating Farms

Look at the long tube attached to the tractor. This artificial "rain maker" has been found more effective and economic in the use of water. Wherefrom do you think the water has been brought to this Suratgarh Farm?

a single state, be it the Ganga in the north or the Cauvery in the south.

In view of the extremely uneven distribution of rainfall in our country, we need to store water in those parts where it is too much. We may then divert it carefully to such other parts where it is too little and hence is in great demand. This again we can and have been

doing through extensive networks of canals. It is in this way that we can have an integrated scheme of controlling floods, irrigating waterthirsty lands and draining away surplus rain water.

Let us presume that we succeed in checking every drop of water of all our rivers from flowing back into the sea. Secondly, we may imagine for a while that the surface of our country is entirely flat. We are told that under these two conditions there would be fifty centimetres of standing water all over the country. So huge are our water resources!

It is obvious that we cannot use all our water resources for various reasons. There are wide fluctuations in the flow of the river waters from season to season. Then the uneven nature of the land relief is yet another difficulty in using all our water resources. Keeping these and some other considerations in view it has been found out that nearly one-third of the total flow of our river waters could be utilized by us for irrigation.

Of this total *usable flow* of our river waters we have been able to utilize nearly two-fifths so far. We have nearly 45 per cent of the total irrigated area under canal irrigation.

In the above context it would be interesting to compare the rivers rising in the Himalayas with those of peninsular India. The rivers rising in the Himalayas are fed both by rain and snow. As a result they flow all through the year and are perennial. The seasonal variations in their flow is relatively less. In view of this fact they do not require huge dams to be built across their beds to store water. In the upper reaches these rivers flow swiftly forming cascades and waterfalls. They provide useful sites for locating water-power stations to develop *water-power* or hydro-electricity.

The rivers of the peninsular India on the other hand are solely fed by the monsoon rains. As a result they either become lean or dry

out in the long dry season. They generally flow on a rocky and uneven terrain having often steep slopes. They are thus less useful for irrigation and water-power, unless their water is stored through gigantic dams demanding huge investments.

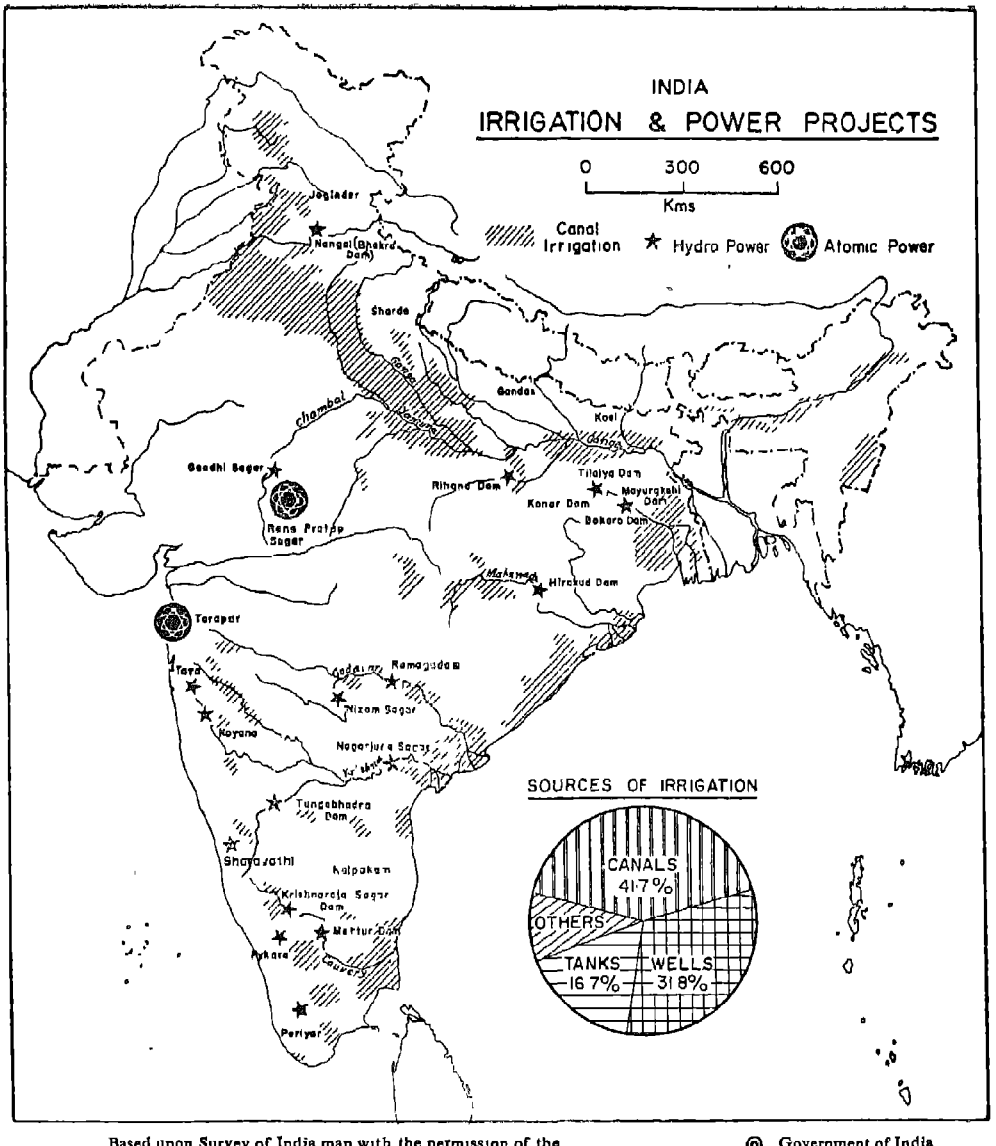
In the south most of the dams are built of stone which is strong and readily available at low cost. The dams made of stone are called *masonry dams*.

River Valley Projects

After Independence, more and more emphasis is being laid on tackling the problems of irrigation, flood control and drainage in an integrated fashion. Big projects have been planned aiming at an all-sided development of the entire river valley. Since they help to serve several purposes at a time, they are known as *multi-purpose projects*.

In a multi-purpose river valley project one or several big dams are constructed to store water. The water thus stored is then utilized when it is in great demand. Such dams naturally help in checking the floods as well. In catchment areas of these rivers an intensive programme is undertaken to plant trees. This is known as *afforestation*. The main idea behind this is to conserve both water and soil. Water is taken down the steep slopes for developing hydro-electricity. Thus these projects become a permanent and an inexhaustible source of electricity at low cost. Wherever possible, canals are also made navigable for boats and small ships. These man-made lakes are also stocked with fish. These big river projects are often described as the new temples of modern India, and attract large number of tourists.

The Damodar Valley Project in Bihar and West Bengal was the first of its kind undertaken in India immediately after Independence. It consists of a series of dams built on the Damodar and its tributaries. Besides irrigating large area it checks floods which used to cause great havoc in West Bengal. One of its canals has been made navigable.



Based upon Survey of India map with the permission of the Surveyor General of India

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The territorial waters of India extend into the sea to a distance of twelve nautical miles measured from the appropriate base line

FIG. 28. *India—Major Irrigation and Power Projects*

Note the important river valley multipurpose projects. Which project serves the maximum number of states in India? What is the relative importance of canal, well and tank irrigation in India?

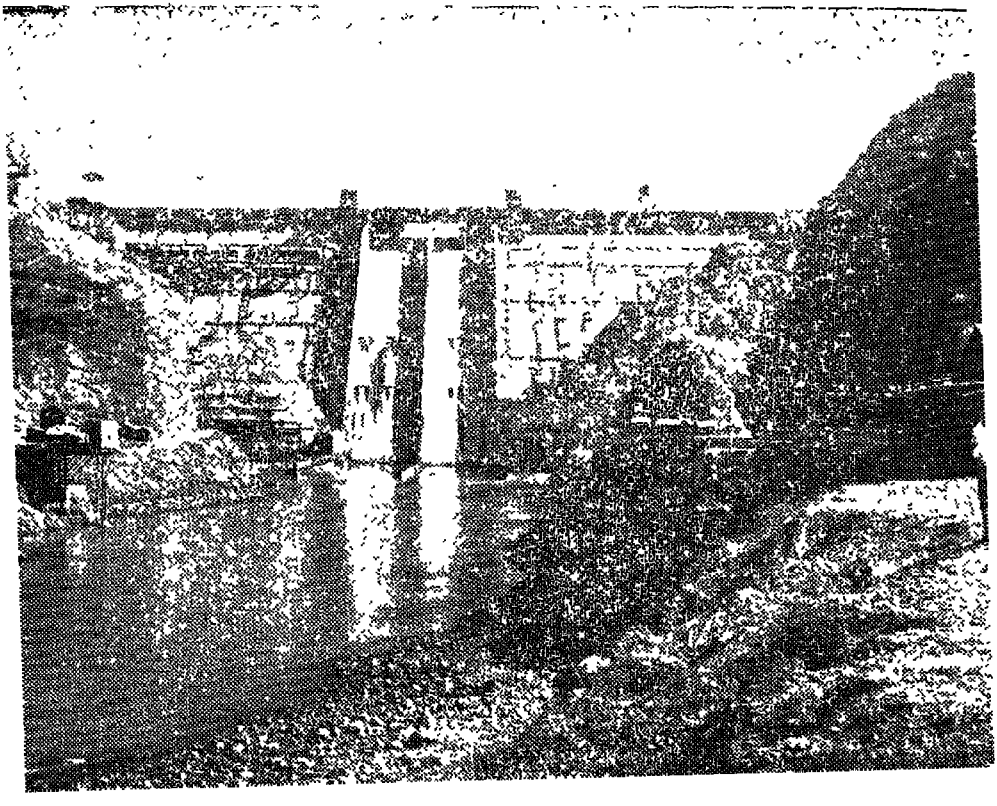
The importance of this river valley project lies also in the development of hydro-electricity. Power is in great demand for the development of extremely rich mineral resources found in this region.

In the north the Bhakra Nangal Project is another big river valley project. The states of Himachal Pradesh, Punjab, Haryana, Rajasthan and Delhi are its beneficiaries.

The Bhakra Dam with a height of 225 metres is the world's highest gravity dam constructed across the river Sutlej. A huge wall

XXII. The Bhakra Dam

This highest gravity dam in the world has been erected across the river Sutlej. Note how it connects two hills through which the river had been flowing Do you see cranes, power towers and electric wires in the picture?



has been built between the hills standing on either side of the river. It is claimed that the cement concrete used in this dam would be enough to build a highway from Delhi to London. Bricks used in this project, if laid in a single row, would be sufficient to connect our earth with the moon! The great man-made lake behind this dam is known as Gobind Sagar, named after Guru Gobind Singh. It is expected to irrigate 1.4 million hectares of land and produce badly needed hydro-electricity for the north-western part of our country.

The Beas is yet another important project of Punjab and Rajasthan. It consists of the Beas dam at Pong and the Beas Sutlej link.

Rajasthan Canal Project will utilize waters of the Sutlej, the Ravi and the Beas to irrigate land in Ganganagar, Bikaner and Jaisalmer districts in north-west Rajasthan. The main canal in Rajasthan itself would be 468 kilometres long. There will be a feeder canal 215 kilometres long. A considerable progress has already been made on this project.

The Kosi Project in Bihar will help in irrigation and controlling floods. So far the river has been known as the "Sorrow of Bihar" because of havoc caused by the river during floods. When tamed the river will change North Bihar into a prosperous region. The project will help Nepal as well.

The Hirakud Project across the Mahanadi in Orissa is the world's longest dam and will help to irrigate large areas in the delta of the Mahanadi.

In the south, the Tungabhadra Project is a joint venture of Andhra Pradesh and Mysore. In Andhra Pradesh the Nagarjuna Sagar Dam has been built on the Krishna river. The Chambal Project consists of three big dams—the Gandhi Sagar Dam, the Kota Barrage and the Rana Pratap Sagar Dam. It will irrigate large areas in Madhya Pradesh and Rajasthan.

In addition to these, there are various projects that are in progress in different parts of the country. The total length of the irrigation canals in our country is over 100,000 kilometres.

India has also to share its water resources with its neighbours, especially Pakistan and Nepal. Under the Indus Water Treaty, India is to utilize the waters of the Sutlej, Beas and Ravi, whereas the waters of the Chenab and Jhelum are ear-marked for Pakistan except for the limited local use for the State of Jammu and Kashmir. Under this agreement nearly 80 per cent water of the Indus system is thus made available to Pakistan, and the remaining 20 per cent to India.

Water-Power

Scientists have calculated the maximum water-power that can be developed by each country. Accordingly they have placed India to be the fifth country in the world. Nearly 40 million kilowatts of hydro-electricity can be developed in our country. Of this total capacity we have developed only about 10 per cent so far. But it must be remembered that it is nearly ten times more than what we possessed at the time of Independence. Many schemes are already under way and our total developed water-power has been increasing rapidly. It is supplemented by the thermal electricity produced with the help of coal. At present the proportion between the two is roughly fifty-fifty.

The first water-power station in India was set up at Sivasamudram on the Cauvery in Mysore State in 1902. It was followed by the Tata Hydro-electric Scheme in the Bombay-Poona region and the Pykara in Madras. The Mandi Power House in the Himachal Pradesh was the first scheme developed in the Himalayan region where our largest water-power resources are concentrated. The Bhakra Nangal, the Hirakud, the Damodar Valley, the Koyna, the Rihand, the Sharawathi are the other important power projects that have been developed in

recent years.

The water-power that we have developed so far has already succeeded in changing the face of our land. A large number of factories and thousands of tube wells are being run on water-power. It provides employment bringing hope, happiness and prosperity in its wake.

THE NEW TERMS YOU HAVE LEARNT: *Ground Water*—Water stored up in the ground. Also called sub-soil water. *Inundation Canal*—Canals meant for diverting flood waters for checking floods and irrigating fields. These canals are seasonal. *A Multi-purpose Project*—A big river valley project serving several purposes at a time—irrigation, flood control, conservation of water and soil, navigation, development of electricity, tourism and fishery.

EXERCISES

Review Questions

1. Answer the following questions:
   (i) What are the three important sources of irrigation?
   (ii) What is ground water?
   (iii) In what three ways do the rivers of peninsular India differ from those rising in the Himalayas?
   (iv) Name four important water-power projects of India.
2. Distinguish between:
   (i) An inundation canal and a perennial canal.
   (ii) A well and a tube well.
   (iii) A tank and a dam.
3. Fill in the blanks:
   (i) Tank irrigation is most common in the States of.....and .....
   (ii) The.....water-power project was the first ever in India.

(iii) In the Himalayan region the first water-power station was set up at.....
(iv) The.....dam is the longest dam in the world.
(v) The highest gravity dam in the world is the.....dam.

4. Write an essay of about 20 lines on the importance of irrigation in India. Give at least four reasons along with suitable examples.

5. What is a river valley project? Explain the various aspects of any one river valley project in India.

Map Work

6. On an outline map of India show the following:
(i) The areas with a large number of tube wells.
(ii) An area where tank irrigation is very common.
(iii) Areas with a close network of canals.
(iv) Pykara, Sharawathi, Koyna, Rihand, Hirakud and Bhakra.

Topic for Class Discussion

7. *Are Rivers a Source of Misery or Prosperity?*

Let one group explain in what ways rivers are responsible for causing great damage. Then the other group may explain how these things can be overcome turning rivers into source of happiness and prosperity. Discussion may be concluded by organizing an exhibition of pictures showing how rivers when tamed help to bring prosperity.

15

Our Underground Wealth

THE TERMS YOU ALREADY KNOW : *Sedimentary Rocks*—Rocks developed as a result of sediments deposited in layers one over the other *Metamorphic Rocks*—Rocks developed as a result of drastic change in the basic characteristics of original rocks. This happens owing to extreme heat, very high pressure and intense chemical action deep inside the earth's crust.

WE have been using every natural resource found on the earth's surface, be it soil, water, natural vegetation or animal wealth. They are of course the most conspicuous of the gifts provided by nature. But is this all that we make use of?

Think of innumerable machines made of iron and steel. Then there are wires made of copper or aluminium helping us to conduct electricity. Remember how coal is used for producing steam or electric energy to run big machines like railway engines. In the absence of petroleum our motor cars and aeroplanes would be good for nothing. Wherefrom shall we have costly ornaments and jewellery had there been no valuable metals like gold and silver, and precious stones like diamonds? Can we have food to our taste unless there is salt?

All these products which we value so much in our daily life are made of minerals which nature has generally preferred to keep

hidden from us. Now we know that considerable mineral wealth is buried deep under the surface of the earth. We shall see in this chapter what is in store for us beneath the earth's surface. Also, you may like to know how we procure it.

Minerals and Metals

The earth's crust is made up of rocks. Rocks in turn are composed of minerals. When rocks spread over a large area have a high proportion of a certain mineral it is said to be a mineral-ore. Our country possesses a large variety of mineral-ores in fairly huge quantities. *Mineral-ores* are the metals in their raw state as extracted from the earth. For instance, iron is a metal. But it is found in the form of iron-ore. The actual amount of iron content in the rich iron-ore may not be more than 70 per cent. Obviously it is mixed up with other minerals or impurities from which it is to be separated. This is done by *smelting*.

Minerals are of two kinds—*metallic* and *non-metallic*. For instance, iron-ore is a metallic mineral. So is bauxite, the ore from which aluminium is obtained. On the other hand sulphur, coal, petroleum and salt are non-metallic minerals. The important metals are iron, copper, aluminium, tin, zinc, lead, silver and gold. Metals are generally solid and heavy. They are often hard and have a shine or a lusture of their own. Metals can be melted. They can be drawn into wire. They can also be rolled into sheets.

Among the non-metallic minerals coal and petroleum are the most useful. They are now the most important sources of energy required for transport and industry. We burn these minerals as fuels to generate power. They are, therefore, known as *mineral fuels*.

Mining and Drilling

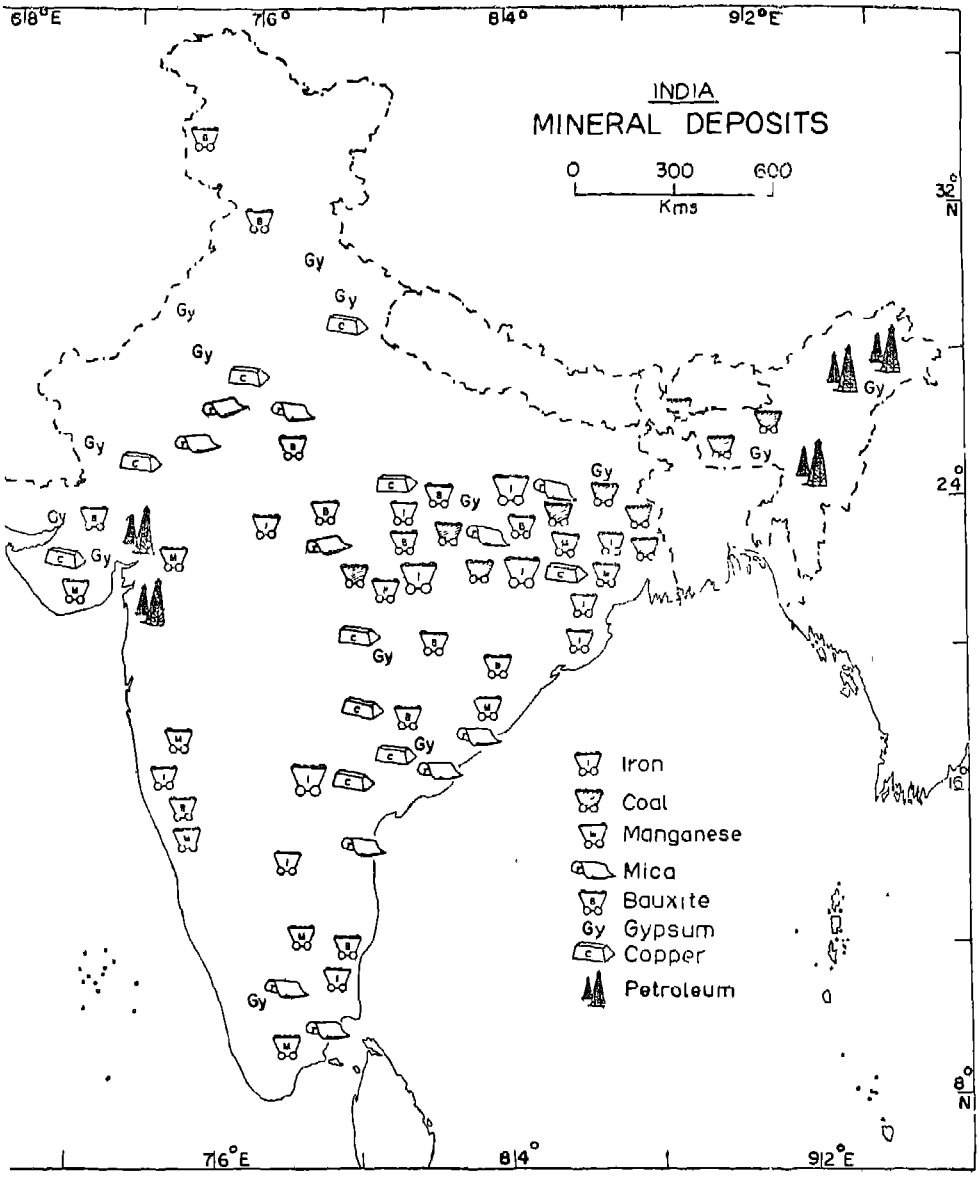
An open-pit from which stone is obtained is known as *quarry*.

When such an open-pit is on a big scale it is called an *open-pit mine*. Many of the mineral-ores, as you know, are buried deep under the earth's crust. In order to reach such deep mineral deposits a big and deep bore is dug into the earth's crust. Such a mine is called a *shaft mine*. Miners are lowered to the bottom of the mines through a lift. The mineral-ores from these mines are brought to the earth's surface through the lifts. The shaft mines consist of numerous horizontal or inclined tunnels in different directions and at different levels. They are something of an underground bee-hive in which hundreds of miners are quietly at work day in and day out.

You know what a well or a tube well is. They provide us with fresh or sweet water to drink and also to irrigate crops. There are, however, some very deep wells which give us not the water but the natural gas and mineral-oil. They are called *oil wells*. The process of digging oil wells and bringing out mineral oil is known as *drilling*.

Prospecting Our Mineral Wealth

The mineral wealth as you know is generally hidden under the earth's surface. Finding it out is by no means an easy task. There are scientists who study the nature of rocks and their formation. They map different layers of rocks and the sequence in which they are laid one over the other. From this they are able to deduce the relative age of each rock, and reconstruct or unfold the story of the earth. These scientists, known as *geologists*, believe that the story of the earth is written in rocks. They tell us that metallic minerals are found in igneous rocks. Non-metallic minerals are generally associated with sedimentary rocks. Highly sensitive instruments now assist us in prospecting mineral deposits.



The territorial waters of India extend into the sea to a distance of twelve nautical miles measured from the appropriate base line

FIG. 29 *India—Mineral Deposits*

Note that the deposits of iron and coal are in close proximity to one another. What are its implications?

Deposits of Metallic Minerals

Iron—India has very huge deposits of iron-ore. It is estimated that we possess about 21,000 million tonnes of iron-ore. This is about one-fourth of the world's known deposits. Our iron-ore deposits are located in Singhbhum district in Bihar and the adjoining parts of Orissa. These two states together produce nearly 85 per cent of our iron-ore production. Some of our iron-ore deposits are also found in Madhya Pradesh, Andhra Pradesh, Mysore, Tamil Nadu and Maharashtra. Now the total production of our iron-ore exceeds 20 million tonnes a year. A very large proportion of this iron-ore is exported to Japan.

Bauxite—India is also rich in bauxite deposits. The total reserves are estimated to be about 250 million tonnes. Aluminium can be extracted from bauxite only when there is abundant power at low cost. This metal is used in the manufacture of aeroplanes and electric wires. Bihar, Gujarat and Madhya Pradesh are the major producers of bauxite. Some deposits are also available in Mysore, Tamil Nadu and Maharashtra.

Manganese—This mineral is used in the manufacture of special varieties of steel. It helps to harden steel. India possesses large deposits of manganese-ore. The deposits are estimated to be 180 million tonnes. Our annual production of manganese is about 1.5 million tonnes. Orissa is the leading producer of this ore followed by Mysore, Madhya Pradesh and Maharashtra. We are one of the important exporters of this ore.

Copper—Our known deposits of copper-ore are very scanty. Singhbhum and Hazari Bagh districts of Bihar and Khetri fields in Rajasthan have some deposits. Our annual production of the finished copper is expected to be 30,000 tonnes which is far from enough.

Gold—India has very meagre reserves of gold. Kolar is almost the only gold mine in India. This mine located in Mysore State

is worked by the Government of India It is one of the deepest mines in the world. Of late its working has become more and more expensive. Our share in world production is insignificant.

The production of silver, lead and zinc in India is very low. We have to import these metals from abroad to meet our requirements.

Non-Metallic Minerals

Mica—Mica is a non-conductor of electricity. It is, therefore, widely used in electrical goods. India has the largest deposits of mica in the world. It accounts for nearly two-thirds of the world's production. Bihar accounts for nearly a half of our annual production of mica. The remaining half is shared equally by Andhra Pradesh and Rajasthan.

Salt—We obtain salt from sea, lakes, and rocks. Sea salt is obtained mostly along the coasts of Gujarat, Tamil Nadu, Maharashtra and Andhra Pradesh. More than half of sea salt is made along the Gujarat coast. The lake salt comes from Sambhar lake in Rajasthan. It accounts for nearly one-tenth of the total production of salt in India. Rock salt is obtained from Mandi district in Himachal Pradesh. Its annual production is only 1 per cent of the total salt produced in India. The maximum annual production of salt has been about 8 million tonnes. We are one of the leading exporters of salt.

Diamonds—India was once known for its diamond mines of Panna in Madhya Pradesh and Golkonda mines in Andhra Pradesh. Now once again the Panna mines are being worked. Our annual production has reached nearly 9,000 carats per annum. The mines are worked by a government-owned corporation. Diamonds are in fact metamorphic rocks made of carbon. They are, therefore, extremely hard and are used for industrial purposes. They are also used in jewllery.

Gypsum—Gypsum is mainly used in the manufacture of fertilizers, cement and sulphuric acid. Our annual production is in excess of 1,000,000 tonnes a year. Nearly four-fifths of it comes from the desert region of Rajasthan.

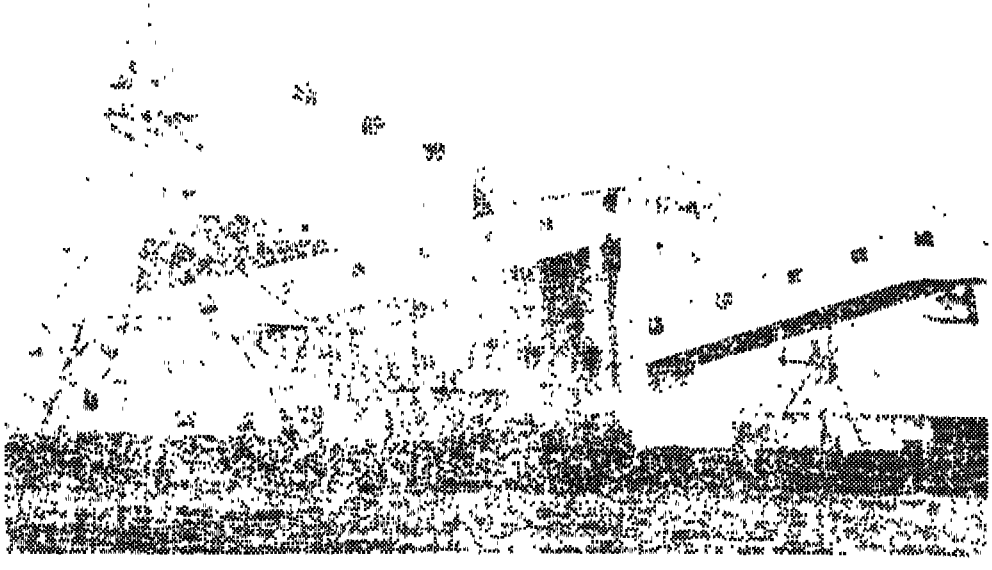
Limestone—Limestone is a sedimentary rock originally formed in shallow seas. It is composed of shells and skeletons of dead sea animals like clams, oysters, corals and algae. This stone is used in the manufacture of cement and mortar. Its most important use lies in smelting iron-ore. Our annual production is about 20 million tonnes. It is found in the states of Bihar, Orissa and Madhya Pradesh.

Mineral Fuels

Coal—Coal is yet another sedimentary rock. It is derived from an accumulation of various types of plant material buried long, long ago in swamps. In course of time they were covered with layers of other deposits. This vegetal material deposited in different layers is partially decayed losing most of the elements excluding carbon. Thus coal is found generally in sedimentary rocks in layers called *seams*.

In India coal reserves are estimated differently. They are at least 100,000 million tonnes. However, the best quality coal is estimated to be 5,000 million tonnes only. Our annual production has reached now 70 million tonnes. We must use our quality coal cautiously. We must also see how best we can utilize our low quality coal. One way of doing it is to produce thermal electricity near the pit-head itself.

Nearly four-fifths of our coal reserves are in the Damodar Valley in the states of Bihar and West Bengal. The well known coal-fields in this area are Raniganj, Jharia, Giridih, Bokaro and Karanpura. The other coal-fields are found in the valleys of the Godavari, Vardha, Sone and Mahanadi. Some coal is also found in Madhya Pradesh.



XXIII. Bokaro Power Station

This thermal power plant is one of the largest in the country. It produces electricity from coal. Why are such big power plants needed in this region?

Indian Railways are the largest consumers of coal. Railways along with iron and steel industry consume nearly half of our annual production. Now new coal-fields are being developed by the National Coal Development Corporation of India set up by the Government of India. The Korba Mines in Madhya Pradesh are such new mines, and have been fully mechanised.

Mineral Oil—Petroleum is yet another mineral fuel found in sedimentary rocks. It is believed that organic marine sediments are the original source of petroleum. In India the rocks which may contain reserves of mineral oil are found in the valleys of Brahmaputra and Surma in Assam, in Northern Plains, the Ganga delta

in West Bengal, the plains of Gujarat and the desert region of Rajasthan. It is also likely to be found in the coastal area of Kerala and in the deltas of the Cauvery, Krishna, Godavari and Mahanadi.

The oil fields which have been proved lie in the valley of Brahmaputra in Assam and in the plains of Gujarat. Off-shore drilling is already in progress with some success in the Bay of Cambay. Our annual production of oil is now nearly 3 million tonnes. This meets only a third of our total requirements. In view of the growing demand for oil we shall have to locate new oil fields and increase our production of oil and natural gas substantially.

Atomic Energy—Uranium and *Thorium* are the important sources of atomic energy. We have large deposits of uranium in Bihar and Rajasthan. The monozite sands found along the coast of Kerala yield thorium. In India we have already constructed an atomic energy plant at Tarapur. It serves the states of Maharashtra and Gujarat. Two more plants are being set up at Rana Pratap Sagar Dam in Rajasthan and at Kalpakam near Madras in Tamil Nadu. The plant near Madras is being set up with the help of our own engineers.

Production of Electricity

Since we get rain every year, water becomes a perennial source of power. It has its own importance. However, we cannot depend upon hydro-electricity alone. In our country we have also been using coal and petroleum to develop thermal electricity. A little more than half of our electricity comes from coal and petroleum. In the year 1967 the total installed capacity of electric energy both thermal and hydel, was more than 10 million killowatts. This was more than five-and-a-half times the total installed capacity at the beginning of the year 1951.

By now all towns with a population above 10,000 have been electrified. On the other hand, only 10 per cent of our villages are

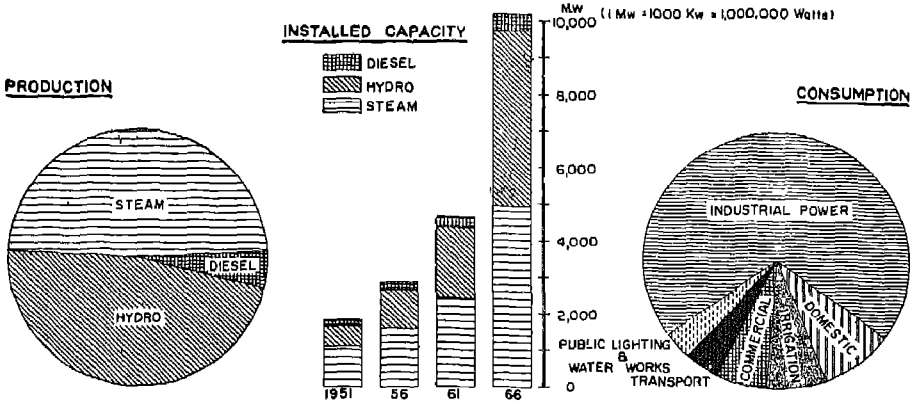


FIG. 30 *Production and Consumption of Electric Energy in India*
Note the relative importance of coal, petroleum and water-power. Which sector consumes the largest amount of electric energy in India?

supplied with electric energy. In spite of our great efforts, we have yet to go a long way in supplying electricity to countryside where it is in great demand.

One killowatt hour of power is equal to 10 hours of continuous work done by one man. It costs very little compared to the wages of manual labour. Therefore, we have to use more and more electric energy to increase production in every field.

It has been calculated that on an average every individual in the world consumes as much energy as can be extracted from 1,500 kilogrammes of coal per year. This average in our country was as low as 161 kilogrammes in the year 1962. In the United States of America the figure was as high as 8,263. Can you now imagine how far we have to go in this direction in order to catch up with the rest of the world?

Our country is thus endowed with rich mineral resources. They provide necessary raw materials for our industries. Some of them are even more important because they provide power to run

the industries. Therefore, they are a must in expanding our industries. However, it must be remembered that mineral resources once used are lost for ever. We should, therefore, conserve them so that we may use them economically. We need to use our mineral resources even more intelligently than what we do with our soil and water resources.

THE NEW TERMS YOU HAVE LEARNT: *Mineral Ores*—Metals in their raw state as extracted from the earth *Geologists*—Scientists who study the nature of rocks and their formation. *Off-shore Drilling*—Digging deep bores into the bed of shallow seas near the coast for extracting mineral oil

EXERCISES

Review Questions

1. Answer the following questions:
   (i) Which is the most important metallic mineral produced in India?
   (ii) What are the two important mineral fuels?
   (iii) Name three sources of electricity
   (iv) Name any four major coal-fields of India.
2. Distinguish between:
   (i) Metallic and non-metallic minerals
   (ii) Rock and mineral-ore
   (iii) Thermal electricity and hydro-electricity
3. Make correct pairs from the two columns:

(i) An open pit from which stone is obtained	(a) Seam
(ii) A big and deep bore dug into the earth's crust to obtain mineral deposits	(b) Bauxite
(iii) A mineral-ore of aluminium	(c) An open-pit mine
(iv) A metamorphic rock composed of carbon	(d) Quarry
(v) Layers in which coal is found	(e) Shaft mine
	(f) Diamond

4 Complete the following statement with the most appropriate ending:
Hydro-electricity is very important because
(a) its production is always very easy
(b) it always costs very little
(c) it is produced from a source that is perennial
(d) we have very large resources for its development

5. Give a brief account of our iron and coal deposits naming the most important States in which they are found.

Map Work

6. On an outline map of India show the following:
(i) The first atomic power plant;
(ii) The first hydro-electric station;
(iii) The new oil-field;
(iv) The river valley where our largest coal deposits are found.

Topic for Class Discussion

7. *Which is more Important—Coal, Petroleum or Water-Power ?*

Let the class divide itself into three groups, each representing one item. Each group may be then asked to present its case to the class. See if the class can reach any common conclusion.

16

Our Manufacturing Industries

THE TERMS YOU ALREADY KNOW: *Small Scale Industries*—Industries in which not many labourers are employed in each unit. *Civilization*—An advanced stage of civilized and social life.

WE derive cereals, fruits and vegetables from the soil. Milk and meat are obtained from animals. We get wood from trees. Wide range of minerals are procured from the deposits of the earth. All these products which we obtain directly from nature are called *primary products*. Agriculture, animal rearing, fishing, lumbering and mining are organized human efforts to obtain primary products. They are, therefore, called *primary industries*.

Many of the products cannot be utilized by us unless they are further processed. We do not consume primary products like wheat, sugar-cane, cotton, surplus milk, logs, and iron-ore in their original form. We use them as bread, sugar, cloth, butter, furniture and iron bars. The products which have been processed and transformed into utilities are called *secondary products*. The organized human efforts to transform primary products into secondary products are known as *secondary industries*. They are also called *manufacturing industries*.

Growth of Modern Industry

Formerly the work of processing primary products into secondary products was done at home by members of a family. The work was done with simple hand-operated tools. It involved manual labour and use of muscle or animal power.

In course of time all this has changed. The simple tools like a wheel, a pulley and a lever gave place to more and more complicated and powerful machines. They were run not with muscle or animal power but with the help of energy derived from water, coal or mineral oil. One single machine would do what even a few hundred persons would be unable to perform. Thus they would produce a lot more in much a shorter period of time. Furthermore, articles produced with the help of machines on a large scale were of the uniform size and quality.

A house was too small a place for these 'giants' to work efficiently. Therefore, the place of work moved from an humble cottage to a big establishment called a *factory* or a *mill.*

The use of machines called for specialization and division of labour. A big job was broken up into a series of small steps in a definite sequence. Each worker was responsible for only a part of a small job which he could do more quickly and efficiently. We are now living in this age of 'modern industry.'

Nowadays, growth of industry depends upon a large number of factors. First of all there should be adequate and continuous supply of raw materials. In India, many of our industries depend upon agricultural raw materials like cotton, jute, sugar-cane, oil-seeds, rubber and tobacco. Another set of industries are based on mineral resources such as iron-ore, mineral oil, coal, gypsum, salt and sulphur. Supply of cheap electric energy is a must for the rapid growth of industries. Adequate facilities of quick transport are equally neces-

sary. Industries also require huge amounts of money or capital for setting up machines, purchasing raw materials and paying wages to labour. Well-trained and skilled labour should also be readily available. Finally, there should be a good demand or *market* for the products of industry. Fortunately, we fulfil most of these requirements.

Industries are classified in various ways. Industries employing a large number of labour in each unit are known as *large-scale industries*. Cotton and jute textile industries are good examples of such industries. Industries producing fans, cycles, sewing machines belong to *small-scale industries*. Industries which are most common in villages are called *village industries*. Handloom, khadi and leather are examples of this type. Then there are *handicrafts* and *cottage industries* in which artisans work with wood, cane, ivory, brass, stone, clay and the like. Industries are also classified according to ownership. Industries belonging to individuals or a group of them are known as *private sector industries*. Then there are certain industries which are owned and managed by the Government, for instance defence industries. They are said to be in the *public sector*.

INDUSTRIES BASED ON AGRICULTURAL PRODUCE

In India, industries depending upon agriculture have a great part to play. Textiles, sugar, beverages, vegetable oil, tobacco and rubber are the major industries under this category. Then there are rice mills, flour mills and oil mills scattered almost all over the country.

Textile Industry

This is one of the oldest and the most famous industries of India. Cotton cloth was made in India even in the days of the Indus Valley Civilization. The spinning wheel and handloom have been in use in our country since long. Even today they are

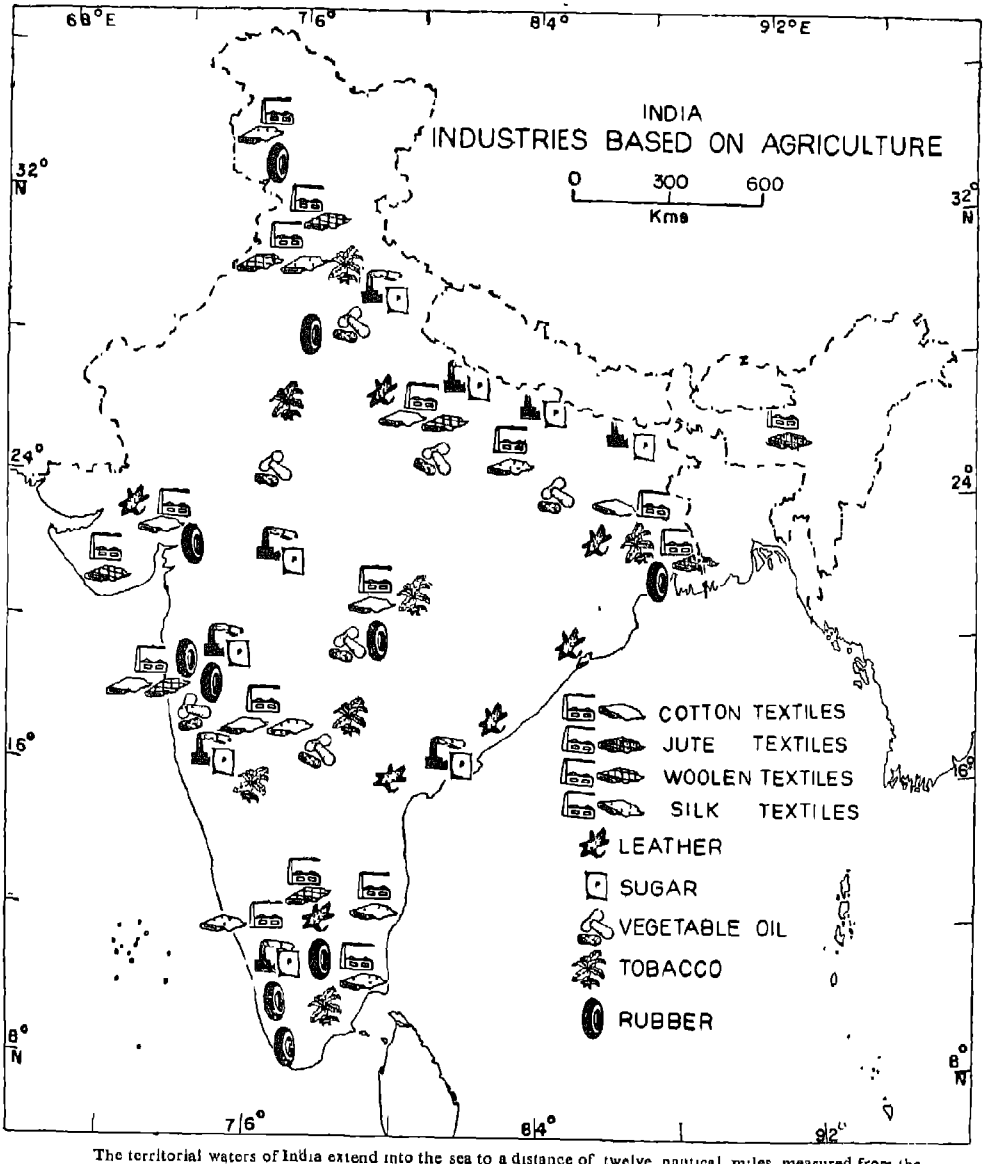
seen in almost every village, providing employment to a large number of people.

The modern textile industry was born in India in 1854 when the first cotton mill was set up in Bombay with Indian capital. Today there are more than 650 cotton mills. The industry provides direct employment to about one million workers. In 1968 the mills produced 4,366 million metres of cloth. The industry is concentrated in cotton-producing states of Maharashtra and Gujarat. Bombay and Ahmedabad are the two leading centres of this industry. The other centres are Coimbatore, Sholapur, Calcutta, Kanpur, Nagpur and Indore.

A considerable part of our cotton textiles is produced on handlooms and powerlooms. The beautiful Indian sarees are produced in this sector. So is the entire production of *khaddar* cloth made out of hand-spun yarn. Over 3,000 million metres of cloth is still produced in this sector. The total amount of cloth thus produced in the country comes to about 15 metres per head of our population. We now export different varieties of cloth to foreign countries including the United Kingdom and the United States of America.

Jute Textiles: This is yet another important industry of India. There are over 110 jute mills in our country. Most of them are located along the river Hooghly around Calcutta. Nearly 300,000 workers are employed in this industry. India has nearly half the world's total capacity of jute manufacture. Our total production of jute cloth in the year 1968 was over one million tonnes.

Woollen Textiles: There are about 50 woollen textile mills in the country. Nearly half of them are situated in the state of Punjab. The total production of woollen cloth was 9.2 million metres in the year 1967-68. The important centres of this industry are Amritsar, Dhariwal, Kanpur, Bombay, Srinagar, Bangalore and Jamnagar.



The territorial waters of India extend into the sea to a distance of twelve nautical miles measured from the appropriate base line

FIG. 31. *India—Industries Based on Agriculture*

Note the concentration of jute, cotton and sugar industries. Which of the industries are related to animal products?

Silk Textiles: India has been famous for its silk textiles since long. Its silk products have been in great demand in many parts of the world. The states of Mysore, West Bengal, Jammu and Kashmir, Himachal Pradesh and Assam are the producers of raw silk.

The important centres of silk industry are Murshidabad, Varanasi, Srinagar, Amritsar, Mysore, Thanjavur and Kanchipuram near Madras.

Synthetic Textiles: India now also produces rayon, nylon, terene and dacron varieties of man-made fibres developed through chemical processes. They are known as synthetic fibres. The important centres of the industry are Bombay, Ahmedabad, Surat, Calcutta, Amritsar, Gwalior and Delhi.

Sugar Industry

India is the largest producer of sugarcane. If we take into consideration *gur*, *khandsari*, and sugar produced from sugarcane, India stands first in the world. There are about 200 sugar mills in the country. Half of the sugar mills are located in Uttar Pradesh alone. The annual production of sugar in India now exceeds three million tonnes. India is now in a position to export its surplus production.

Vegetable Oil Industry

India is the leading producer of oil-seeds. Oil derived from the oil-seeds such as groundnuts and cotton seeds is converted into vegetable ghee or vanaspati.

Paper

The first machine-made paper was manufactured in India in the year 1870 near Calcutta. Now there are nearly 60 paper mills in the country producing nearly 750,000 tonnes of paper and paper board every year. In view of the growing demand for newsprint,

India has set up a newsprint mill at Nepanagar in Madhya Pradesh. It now produces over 30,000 tonnes of newsprint every year. Its capacity is being raised to 75,000 tonnes per annum. Nearly 70 per cent of the raw material for our paper industry comes from bamboo-pulp.

INDUSTRIES BASED ON MINERALS

Most of the modern industries fall under this category. Iron and steel industry is often called a *key industry* as it serves as a backbone to many other industries.

Iron and Steel Industry

India possesses abundant reserves of iron-ore and limestone. It has some coal reserves as well. Deposits of all the three minerals are found close to one another. This has helped in avoiding transport costs. In India there are four big iron and steel plants. They are at Jamshedpur, Bhilai, Rourkela and Durgapur. The new steel plant at Bokaro is under construction. All these centres are located near the iron and coal fields in Bihar, West Bengal, Orissa and eastern Madhya Pradesh. There is another steel plant at Bhadravathi in Mysore. In addition to these, three more steel plants are going to be located at Hospet in Mysore, Salem in Tamil Nadu, and Vishakhapatnam in Andhra Pradesh. The annual production of pig-iron in India now exceeds seven million tonnes. The total out turn of crude steel is about six and a half million tonnes.

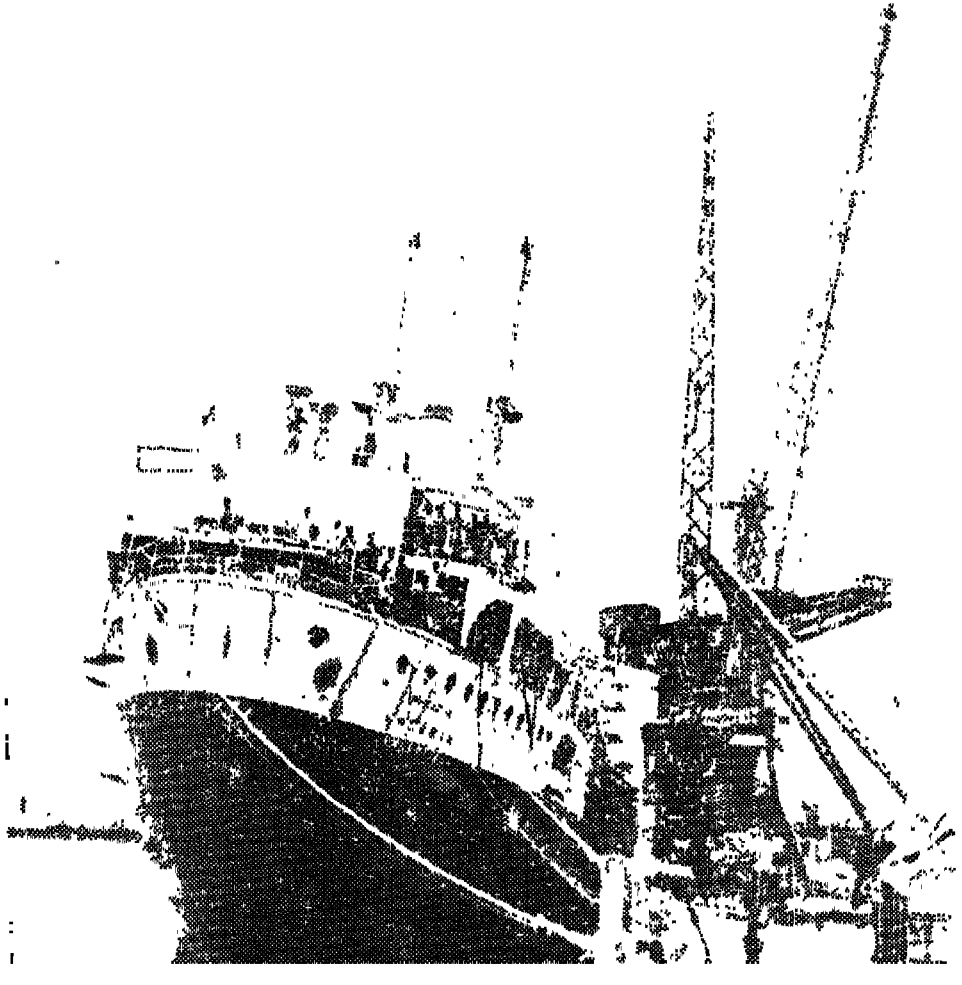
Railway Engines and Wagons

India with its large network of railways requires railway wagons, coaches and railway engines in large numbers. We are now self-sufficient in most of our *rolling stock* requirements. We now export railway wagons on a very large scale. Broad gauge locomotives running on steam and electricity are manufactured at Chittaran-

jan in Bihar. Engines for metre gauge are produced at Jamshedpur, and the diesel engines at Varanasi. Railway coaches are produced at Perambur near Madras and wagons are manufactured at a number of places.

XXIV. A Ship under Construction

This passenger ship—S.S Andaman—is under construction at Hindustan Shipyard, Vishakhapatnam Note how big cranes are at work



Ship-building

India has now set up ship-yards at Vishakhapatnam, Cochin and Mazagaon near Bombay. The ship-yard at Vishakhapatnam has produced a number of ships. It can now build ships up to 15,000 tonnes. The Cochin ship-yard is under construction. The Mazagaon ship-yard is meant for manufacturing ships for the Indian Navy.

Automobiles

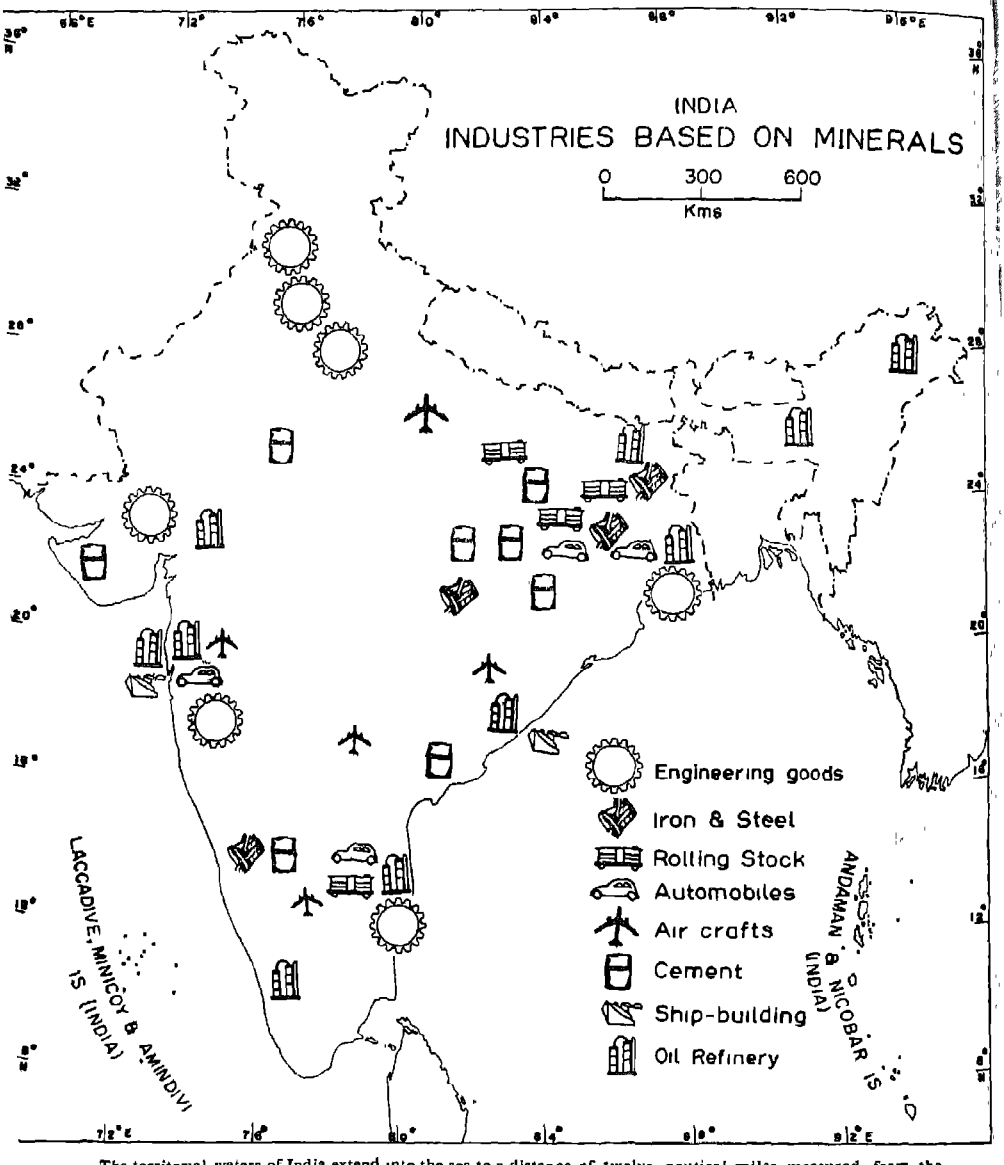
India manufactures cars, trucks, jeeps and scooters. Fiat car is produced in Bombay, Ambassador in Calcutta and Standard near Madras. Trucks or commercial vehicles are produced at Jamshedpur and jeeps in Bombay.

Aircrafts

India now manufactures certain varieties of small aircrafts. Indian aeroplanes are being used by Indian Airlines and Indian Air Force. We now produce Krishak, Pushapak, Gnat, Mig and Avro 748 varieties of aircrafts. The important centres of the industry are Bangalore, Kanpur, Ojhar near Nasik, Koraput in Orissa and Hyderabad in Andhra Pradesh.

Heavy Engineering and Machine Tools

India has now started making its own machinery for different industries. It produces machines for the textile, sugar and mining industries. The Heavy Engineering Corporation at Ranchi now manufactures big machines and equipments required for setting up iron and steel plants. The Hindustan Machine Tools produces a large variety of small and medium machines and has now developed several units of its own at places like Bangalore, Pinjore (Haryana), Hyderabad and Kalamassery in Kerala. One of the units of the Hindustan Machine Tools now produces watches as well. These units are in the public sector and are in a position to export machinery to other countries.



The territorial waters of India extend into the sea to a distance of twelve nautical miles measured from the appropriate base line

FIG 32 *India—Industries Based on Minerals*

Note the concentration of industries in Bihar, West Bengal and Orissa. How will you explain it?

India now produces a large variety of engineering goods like water pumps, diesel engines, electric fans, sewing machines, bicycles and the like.

Oil Refining and Petro-Chemicals

With the growing use of automobiles the demand for petroleum has been rapidly increasing. In spite of the discovery of new oil-fields in Gujarat, we have to import large quantities of crude oil from Iran and other countries around the Persian Gulf. In order to refine crude petroleum several oil refineries have been set up. The oldest oil refinery is at Digboi in Assam. New oil refineries have been set up at Bombay (two refineries), Vishakhapatnam, Barauni, Noonmati, Madras, Haldia (near Calcutta), Cochin and Koyali near Baroda. In the year 1968, 16 million tonnes of crude oil was refined.

Fertilizers

In order to increase the supply of food, the production of fertilizers in our country has become very necessary. The first fertilizer plant was set up at Sindri in Bihar. This was followed by a number of new plants in different parts of the country during the last few years. In the year 1967-68 nearly 359,000 tonnes of nitrogenous fertilizers were manufactured. The production of phosphatic fertilizers was about 200,000 tonnes. By 1973 the total production is expected to be of the order of 3.5 million tonnes.

Cement

The first cement factory was started at Madras in the year 1904. By the year 1968-69 India had raised its annual production of cement to 12 million tonnes. There are now nearly 40 cement factories located in different parts of the country.

Chemicals

India now produces a large number of chemicals, drugs and

pharmaceuticals. It produces sulphuric acid, soda ash, caustic soda and several other chemicals. It is now self-sufficient in antibiotics and a large number of synthetic drugs. Even surgical instruments are now produced in India. Penicillin is produced at Pimpri near Poona. D.D.T. is produced at Delhi and Alwaye.

Heavy Electrical Equipments

The Heavy Electricals at Bhopal produces electric motors, generators, transformers and other equipments for setting up big power plants. Another big plant is being set up at Hardwar. It will produce water turbines and generators.

Electronics

A large variety of electronic goods like telephone, the radio receiving sets, transistorised radio receiving sets and television sets are now being manufactured in India. We also manufacture electronic equipments needed for the defence of our country.

Defence Equipment

India as a free country needs to take every step to guard its long frontiers from foreign invasion. For this purpose the defence equipment is as important as the courage and valour of our defence personnel. In order to become self-sufficient in this field India has taken several steps. It now produces small arms, guns and ammunition in the country. It also produces vehicles for the army. India has set up a tank factory at Awadi in Tamil Nadu. India now produces missiles on its own. However, this is one area in which we have to be on our guard and keep ourselves abreast of the rest of the world.

India has thus made rapid strides in almost every industry. Free India has achieved within a period of about twenty years what

many countries could not achieve even in hundred years of their earlier industrial development. In view of our population, however, we have yet to go a long way to raise the standard of living of our people. The only way to do it is to expand our industries as quickly as possible.

THE NEW TERMS YOU HAVE LEARNT : *Primary Industries*—Organized human effort to obtain primary products. *Secondary Products*—The products which have been processed and transformed into utilities. *Manufacturing Industries*—Organized human effort to transform primary products into secondary products.

EXERCISES

Review Questions

1. Answer the following questions:
   (i) What is an industry? State three characteristic features of a modern industry.
   (ii) What are the four important primary industries of India?
   (iii) Which State leads in sugar industry?
   (iv) Name three makes of motor cars produced in India.
2. Distinguish between:
   Primary industry and secondary industry
3. Make out correct pairs from the two columns:

(i) The leading centre of cotton textile industry	(a) Bangalore
(ii) The manufacturing centre of jute textile industry	(b) Perambur
(iii) The oldest iron and steel town	(c) Jamshedpur
(iv) The centre producing electric railway engines	(d) Bombay
(v) The place where railway coaches are manufactured	(e) Sindri
(vi) Shipbuilding yard	(f) Bhopal
(vii) Centre for producing telephone sets	(g) Vishakhapatnam
(viii) A big fertilizer plant	(h) Chittaranjan
	(i) Calcutta

4. What factors help the rapid growth of industry?
   Explain this with the example of iron and steel industry in India.
5. Give a brief account of the cotton textile industry in India under the following points: causes of early growth, location, and importance of handlooms.

Map Work

6. On an outline map of India show the following:
   (i) Three places known for iron and steel plants in the public sector.
   (ii) Three places known for Mig Factories.
   (iii) Three oil refineries.
   (iv) Three centres of Hindustan Machine Tools.

Topic for Class Discussion

7. *Which Industries Do We Need most—Big or Small ?*
   Let two groups in the class take sides and argue their own cases. Record the conclusions.

17

The Lifelines of Our Country

THE TERMS YOU ALREADY KNOW : *Highway*—A big and important public road connecting distant places. *Pass*—A gap in a mountain range providing natural or easy route across

INDIA has been a country of distances. In the past it required months to travel from one end of the country to another. Yet nothing stood in the way of a devoted pilgrim visiting far off and even inaccessible places like Amarnath and Badrinath on the one hand, and Rameswaram and Kanyakumari on the other. Today, however, this has all changed.

The bullock cart has now given place to the motor car, the truck, the railway train and the aeroplane. The modern means of transport are known for their speed, reliability and comfort. Generally it does not take more than three days to go from one end of the country to the other by an express train. Fast aeroplanes cover the same distance in less than three hours. Thus the modern means of transport have been able to conquer distances making our country a small well-knit unit.

The roads, railways, navigable rivers and canals, coastal waterways and airways have all now become the common means of trans-

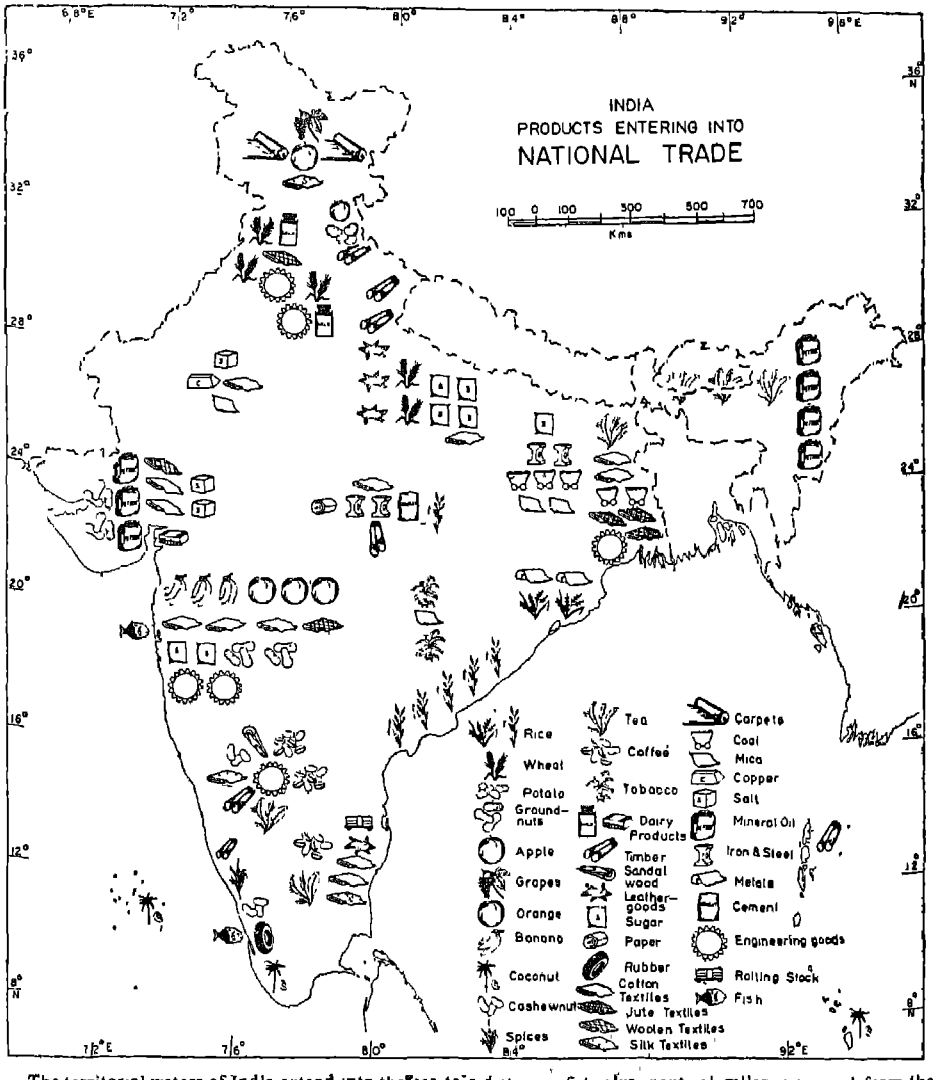
port. It is along them that the people and goods move speedily and conveniently from one place to another. Then there is a network of post and telegraph offices spread all over the country. All our towns and big villages have been interconnected with telegraph and telephone wires. Even more important is the national network of radio stations bringing almost every inch of our land within its reach.

It is these means of transport and communication that are rightly called the *lifelines of a country*. They help in bringing us close to one another, both culturally and economically. The importance of these lifelines in the defence of a vast country such as ours cannot be over-emphasized.

Trade and Transport

For a while, think of the various articles of daily use in your life. Even a cup of tea or coffee cannot be had unless we are able to get tea from Assam, coffee from Mysore and sugar from Uttar Pradesh. May be, the bread you ate this morning was made of wheat brought from the States of Punjab or Haryana. It is likely that vegetable ghee used in cooking was made from groundnuts produced in Gujarat. The white table salt must have come from Rajasthan, unless it is sea salt from Gujarat. The spices that make your food so tasty come all the way from Kerala. So do cashewnuts, coconuts and copra. The bananas and oranges that you buy in a local market are in all probability produced on a farm in Maharashtra. Apples, grapes and dry fruits must have made their way from the valleys of Kashmir or Himachal Pradesh.

Have a look at your clothes. May be, your shirt is made of cloth produced in a textile mill in Bombay. A colourful saree may have been woven into cloth somewhere in Mysore or Tamil Nadu. The yarn for the same is likely to have been spun in Coimbatore



The territorial waters of India extend into the sea to a distance of twelve nautical miles measured from the appropriate base line

FIG 33 *India—Major Products Entering into National Trade*

Note the various products which are surplus in one region but are in great demand in other parts of the country. What basic fact leads to the development of trade?

or Bombay, whereas cotton from which it was spun had been grown somewhere in Maharashtra or Gujarat. A sweater or the woollens which you wear in winter are likely to have come from Punjab. A fine shawl and a beautiful carpet in all probability are the prized products from Kashmir.

The gunny bags which we use for packing foodgrains come from West Bengal—producer of jute, the golden fibre of India. Coir mats are brought from the extreme south, especially Kerala. This State also supplies us with rubber which we require for making various articles of daily use. Footwear which are so essential for us may have been manufactured in Uttar Pradesh.

Timber which we require for making furniture and building houses is likely to have come from the Himalayan region or from Madhya Pradesh. Cement may have been brought from Bihar or Madhya Pradesh. Iron bars and sheets have to be hauled all the way from Bihar, West Bengal or Orissa. This is true of coal which we consume at home or in power houses. Kerosene and petroleum can be had either from Assam or from Gujarat, if it is not imported from abroad.

The means of transport help in collecting raw materials at manufacturing centres. They also help in distributing finished products to various parts of the country. In the absence of the modern means of transport severe famines always resulted in great loss of life. Now large quantities of foodgrains are rushed to famine affected areas from elsewhere in no time.

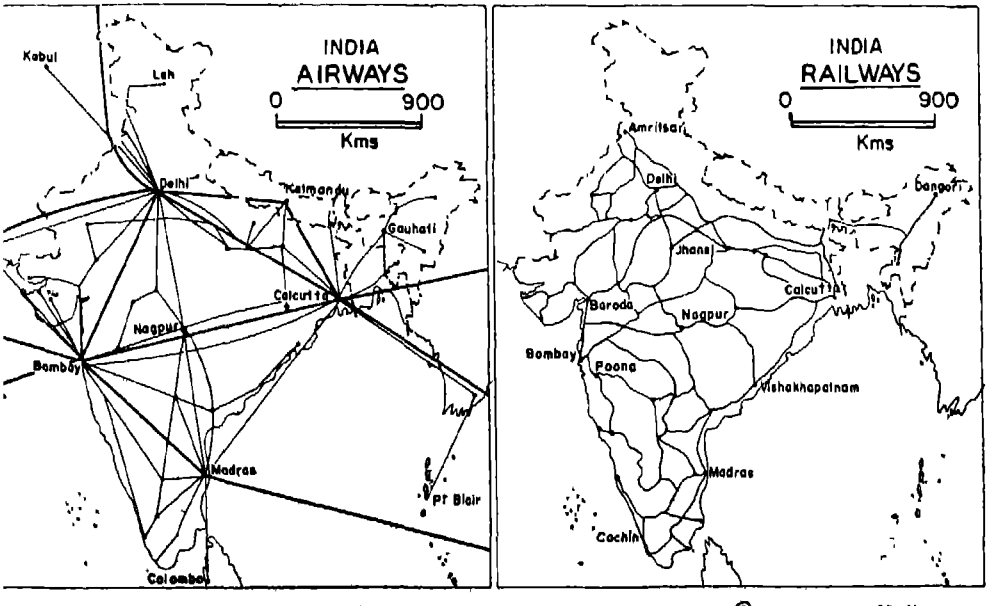
The modern means of transport are a must for making quick movements of our defence forces. They also assist in maintaining a constant supply of ration, ammunition and other supplies to the forces defending our borders. Indeed, the railways in India were built by the British primarily to serve their military needs.

Roads

The importance of roads in India has been realised since early times. The total length of the *surfaced* or *metalled roads* in our country now exceeds 325,000 kilometres. The unsurfaced roads are almost twice as long. Thus the total length of the surfaced and unsurfaced roads in our country is nearly two-and-a-half times the distance between the earth and the moon. However, in view of the total area and the huge population of our country, the total length of the roads is rather inadequate.

FIG. 34. *India—Major Rail Routes and Airways*

Note the major trunk rail routes and airways connecting Bombay, Delhi, Calcutta and Madras: What makes railways the principal means of national transport?



Based upon Survey of India map with the permission of the Surveyor General of India.

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The territorial waters of India extend into the sea to a distance of twelve nautical miles measured from the appropriate base line.

The most important roads, running from one end of the country to the other through several states are called *national highways*. They are developed and maintained by the Central Government. The Government is also responsible for building and maintaining roads in the border areas. During the past few years the Government has been busy in building new roads in the border areas, particularly in the Himalayan region. Some of the important highways connect India with Tibet, now part of China, through the mountain passes. Locate Chumbi valley, Shipki La and Karakoram pass along our northern frontiers.

The important national highways connect places like Bombay, Calcutta, Delhi, Madras, Kanyakumari, Leh, Kandla and Sadiya (Assam) with one another.

The *state highways* are the roads which are important enough within a given state. They are developed and maintained by the State Governments. Also there are district roads which are looked after by the local authorities. Finally, there are village roads. All these roads are taken care of by the States concerned.

Railways

The total length of the railways criss-crossing our country is nearly 60,000 kilometres. This is one-and-a-half times the length of the equator. The railway network in India is the largest in Asia and the fourth largest in the world. On these railway lines more than 12,000 railway engines ply from one place to another, day in and day out. As many as 35,000 passenger coaches are on the move all the time. Over 6 million passengers board railway trains every day.

Perhaps more important is the fact that there are 380,000 wagons engaged in carrying goods over long distances. They carry well over 200 million tonnes of goods every year. This accounts for nearly

four-fifths of the total goods traffic in the country. Thus railways are our principal national means of transport. They have come to occupy this position within a relatively short time since 1854. The Indian Railways are now owned and run by the Government of India. There are more than 1.3 million railway employees in the country.

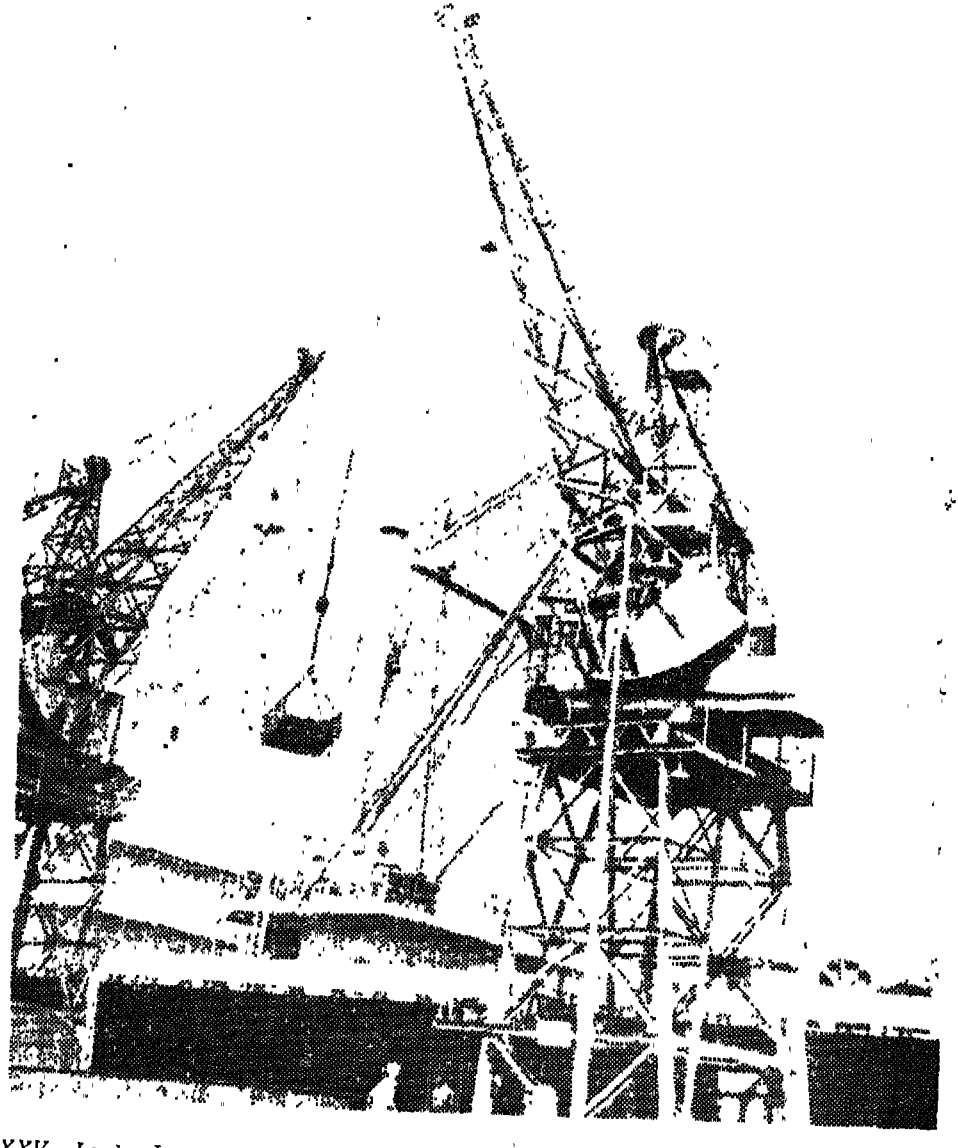
The important railway routes connect the major cities of India—Bombay, Calcutta, Delhi and Madras—with one another. Most of the railway trains either originate or terminate at one of these four cities of India. For instance, there are direct long distance trains running between Delhi on one hand and Bombay, Calcutta, Madras, Puri, Lucknow, Dehra Dun, Kalka, Pathankot, Amritsar, Ferozepore, Bikaner, Udaipur and Ahmedabad on the other. Look at the map and locate trunk routes inter-connecting the four major cities of India.

Indian railways are divided into three categories according to the width of the railway gauge : the broad gauge (1.69 metres), metre gauge, and narrow gauge (.77 metre). The narrow gauge railway track is generally confined to the hills. Nearly half of the railway track consists of broad gauge.

About 3,000 kilometres of the railway track has been electrified. It ensures quick and clean travel. It helps to save or conserve our coal. It has also helped in relieving pressure on railway wagons. Many important long distance trains now run with diesel engines increasing their speed. Rajdhani Express between Delhi and Calcutta is the fastest train in India. It covers a distance of 1,437 kilometres in a little less than 18 hours only.

Waterways

India with a long coastline has eight major ports. They are Bombay, Madras, Calcutta, Cochin, Marmagao, Vishakhapatnam, Kandla and Paradip. Another two ports—Mangalore and Tuti-



XXV. Loading Iron-ore at Marmagao

See how iron-ore is being loaded on the ship. To which country do we export iron-ore?

corin—are being developed into major ports. Major ports serve as gateways of international trade and commerce. In the year 1969, India had 250 ships with a total tonnage exceeding 2 million tonnes. These ships are engaged in coastal as well as overseas trade.

In India inland navigation is almost insignificant. We possess only 14,000 kilometres of inland waterways. Of this just 3,500 kilometres are navigable by steamers. The Ganga and Brahmaputra are the two navigable rivers of India. Also navigable are the lower reaches of the Godavari and Krishna. The canals of these two rivers, the Buckingham Canal in Tamil Nadu and Andhra Pradesh, and West Coast Canals of Kerala are the only navigable canals in India.

Airways

A large number of aeroplanes span our skies. They help in carrying passengers, cargo and air mail. There are about 90 aerodromes in the country. In the year 1968 well over two million passengers were carried by air. This is nearly seven times more than what we could do in the year 1947.

India has four major airports. They are Bombay, Calcutta, Delhi and Madras. The major air flights are mainly confined to the traffic between these four places. These places are in turn connected with various regional towns. The Indian Airlines is mainly responsible for the internal traffic. It has also a few flights with the neighbouring countries like Burma, Ceylon, Nepal and Afghanistan. It has now acquired jet planes (Boeing 737) for its trunk routes to cope with the growing air traffic.

Air travel has in recent years become very important in the north-eastern part of the country. Why should it be so? Look at the map and see how difficult it is to reach Tripura, Manipur, Nagaland, Meghalaya, Arunachal, Mizoram, and Assam from Calcutta. In the hilly and mountainous regions along our northern frontiers helicopter is the

most convenient means of transport. It helps to maintain constant supplies to the *jawans* guarding our frontiers.

India has yet another and a much bigger air service—Air India International. It carries international air traffic. There are regular air flights linking India with a large number of countries of the world. It is one of the most efficient and popular air services of the world. *Maharaja*—its symbol—is now well known in almost every part of the world. The "Air India" has now acquired the jumbo jets, the largest and the fastest commercial planes in the world.

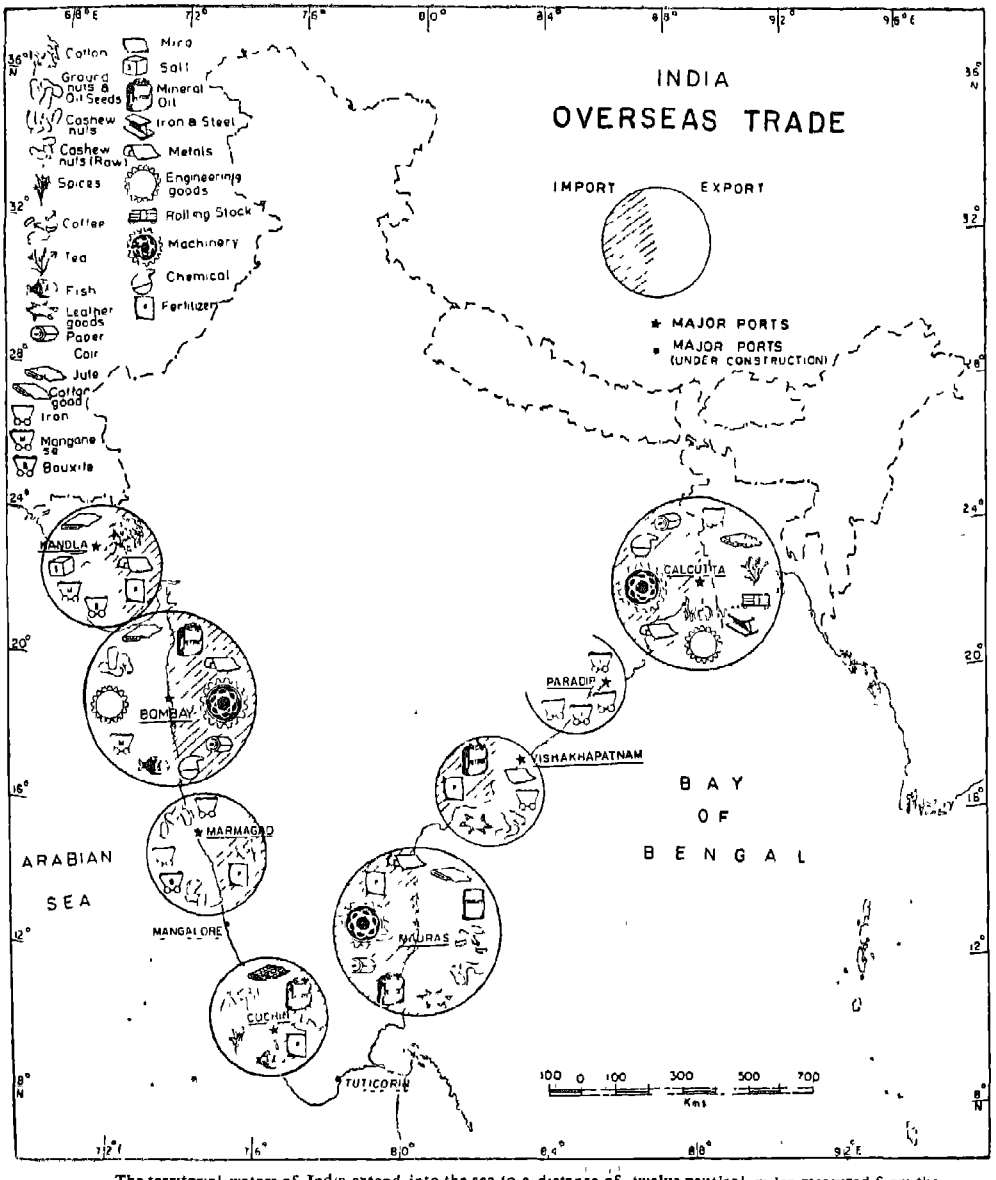
Means of Communication

The means of transport and communication are closely related with one another. There cannot be proper development of one without the other. Can you think of railways and airways without proper means of long distance communications?

There are well over 100,000 post offices throughout the country. The total number of telegraph offices is nearly 15,000. Nearly half a million people are employed by the Post and Telegraph Department of the Government of India. Well over 6,000 million postal articles are delivered by this department each year. There are about 2.5 million kilometres of overhead telegraph wires in our country. The underground cables which ensure more safety and efficiency are two-and-a-half times as long. Urgent personal messages are sent through telegrams at negligible cost.

Telephones, however, represent further improvement over telegrams. In this case "live voices" are carried over telephone wires. Persons separated by a distance of hundreds of kilometres can talk with each other, as if they are sitting face to face. Today there are over a million telephone sets all over the country, all manufactured at Bangalore.

Then there are several means of mass communication. The All



The territorial waters of India extend into the sea to a distance of twelve nautical miles measured from the appropriate base line.

FIG. 35. *India—Major Ports and International Trade*

Note the major items of export from Calcutta, Vishakhapatnam, Paradip and Marmagao. Which are the major imports of India?

India Radio with nearly 70 broadcasting centres all over the country is the most important among them. It is also controlled and run by the Government of India. The total number of radio receiving sets in the country now exceeds the ten million mark. We now plan to set up a national network of television. The first television centre is already functioning in Delhi. All these means of communication help in bringing our people close to one another, culturally, economically and politically.

Imports and Exports of India

It is true that various means of transport and communication have brought different parts of our country very close to one another. They help in speeding up the economic development of different regions. National trade is also promoted. However, this is only a part of the story. The modern means of transport and communication also promote international trade and travel making our world a really small place to live in. Look at Figure 35 and note the major items of export and import of our country.

THE NEW TERM YOU HAVE LEARNT: *The Lifelines of a Country*—The modern means of transport and communication which bring people close to one another and help in economic development, national and international trade and in the defence of the country.

EXERCISES

Review Questions

1. Answer the following questions:
   (i) What are the two important means of land transport?
   (ii) What are the leading four major ports of India?
   (iii) Name the four categories of roads according to their importance.

2. Distinguish between:
   (i) A national highway and a state highway
   (ii) Major ports and minor ports
3. What are the lifelines of a country? Why are they so called?
4. Why is railway transport very important in our country? In what ways do the railways help us?
5. Given below in the first column are certain jobs to be done relating to (A) Communication and (B) Transport. In the other column are listed means for doing the same. Make out correct pairs from the two columns.

(A) Communication	
(i) Sending Rs. 25/- to your relation	(a) Telephone call
(ii) Congratulating a friend on his success	(b) Air mail
(iii) Making urgent queries about the illness of your relation and to give necessary advice immediately	(c) Money order
(iv) Sending medicine from Delhi to a serious patient in Bangalore	(d) Telegram
(B) Transport	
(i) Sending 5,000 tonnes of cement from Katni in (M.P.) to Hyderabad	(a) Express train
(ii) Sending 500 kilogrammes of fresh vegetables from Patiala to Delhi	(b) Cargo ship
(iii) Travelling from Bhopal to Ajmer to attend Urs	(c) Motor truck
(iv) Sending 10,000 tonnes of iron-ore from Goa to Osaka (Japan)	(d) Goods train

Map Work

6. On a map of India show the following:
   (i) A railway route between Delhi and Madras with four important junctions on the way.
   (ii) Four new major ports.
   (iii) Three important international airports, and the airways connecting them.
   (iv) Two important inland waterways.

Topic for Class Discussion

7. *Had there been no Means of Transport and Communication. . . .*

   Let the class discuss this topic around the three points: (a) how it would affect our daily life? (b) how it would affect primary industries and secondary industries? (c) how it would affect the defence of our country?

18

People—the Greatest Resource of a Country

THE TERM YOU ALREADY KNOW: *Average Density of Population*—The number of people that would be found in a unit area, such as a square kilometre, if the total population in a given large area is uniformly distributed.

IT is generally believed that India is one of the large countries of the world. You also know that the nature has been very kind to this land. However, a mere large size of a country or the presence of ample natural resources by themselves do not make a country big. It is its people that really make a country what it is worth. It is they who have to transform the natural resources of a country into wealth through their organized effort and wisdom.

In this concluding chapter we will study the human resources of our country. We may re-examine how really big our country is in view of its huge population. We must have a look at the average density of population and its very uneven distribution in our country. Also we must know how fast our population has been growing. Finally, we must find out its relation with natural resources such as the cultivable land and the food we may be able to produce for all of them.

How Big and Populous Our Country Is

India has a total area of about 3,268,000 square kilometres. It stands seventh in area after the Soviet Union, Canada, China, the United States, Brazil and Australia. The Soviet Union which is the largest country in the world is seven times as large as India. Canada and China are individually three times the size of India. In fact, India does not occupy more than 2 per cent of the world's total land area. Thus you may realise that India is really not a very big country in relation to the rest of the world.

Now let us see how populous is our country. It has now a population of over 547 million people. This makes India the second most populous country in the world, next only to China. However, we must not ignore the fact that China is thrice as large as India. How does it compare with others ? The Soviet Union with seven times the area of our country has not even half as many people as we have. Barring China, all the other five countries bigger than India have together a population smaller than that of India. India alone carries as much as 14 per cent of the world's total population. It means every seventh man in the world is an Indian.

This brings us to the most significant fact. India with only 2 per cent of the world's total land area carries as much as 14 per cent of the world's total population. The average density of population in India is thus seven times what the world as a whole has.

Composition and Distribution of Population

The people in India originally belonged to different races. In course of time they have intermingled losing many of their original traits. Even then we notice great diversity which is so characteristic of Indian people. In fact the richness of Indian culture lies in its diversity. Its spirit of accommodation, tolerance and assimilation makes it one of the major, distinct cultures of the world. Indian people

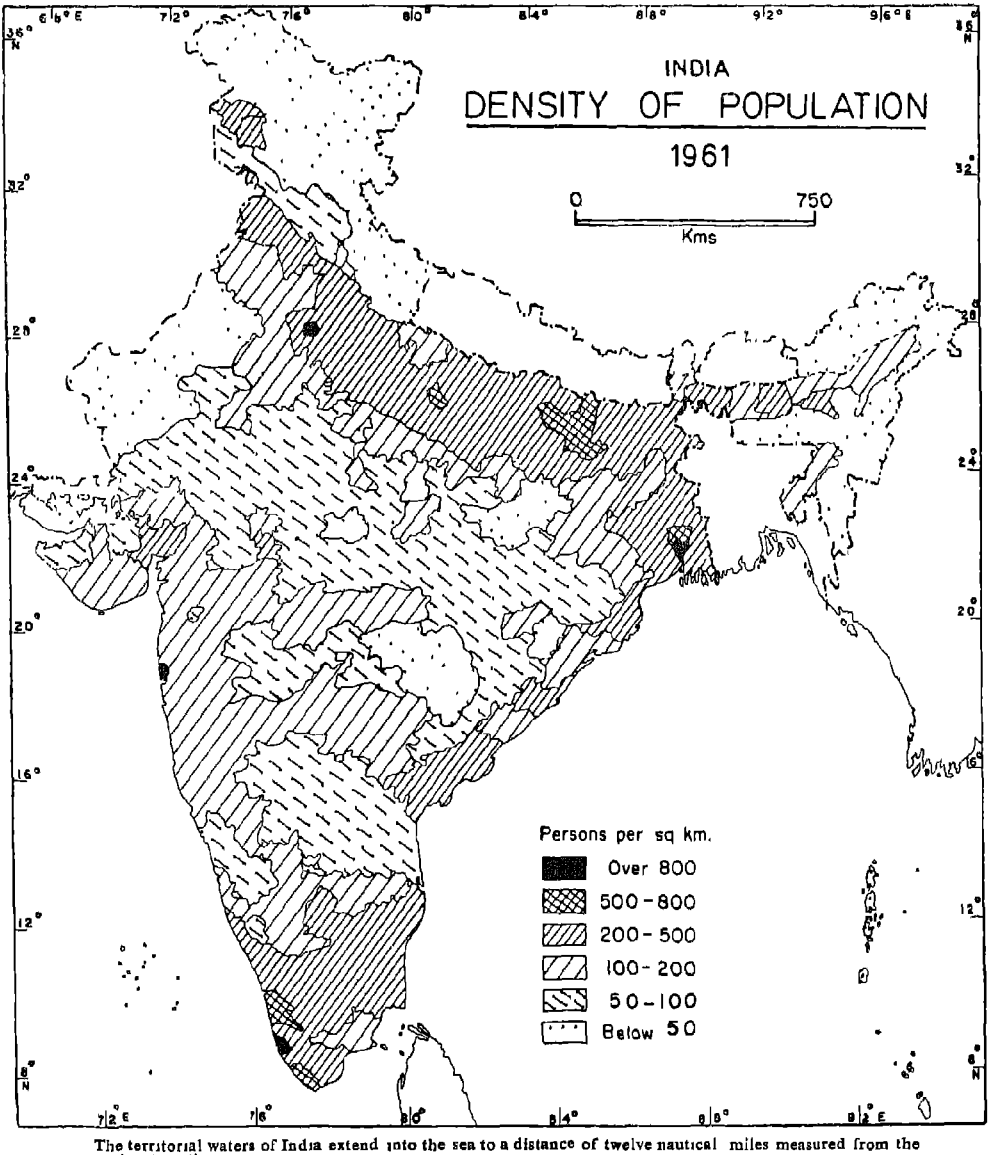
follow different faiths cutting across regional, political and linguistic barriers. They speak different languages which in turn cut across caste, religion and often regions.

In spite of these racial, religious, linguistic and regional diversities of our composite culture, we are all Indians first and Indians last. We all have a common goal or a destiny. We are all engaged in building the strong, united and prosperous India of our dreams. We are eager to see our country occupy its rightful place in the family of nations. Also we want to contribute towards world peace and prosperity. This calls for organized and sustained efforts in harnessing every available resource for the good of all.

If we redistribute our total population evenly all over the country there would be 182 persons per square kilometre. This is its average density of population. But the actual distribution of population in India is very uneven. Look at the map of India showing how the density of population varies from region to region.

The most thickly populated parts of India are Kerala and West Bengal followed by the plains of the Ganga, Brahmaputra, the deltas of the Cauvery, Krishna, Godavari and Mahanadi. The coastal strips, plains of Punjab and Gujarat are also fairly well peopled. The areas which are moderately populated are the Plateaus of the Deccan and the Malwa. The areas which are very sparsely populated are Kutch, western and northern parts of Rajasthan, Jammu and Kashmir, Himachal Pradesh, Kumaun Hills in Uttar Pradesh, Arunachal, Nagaland and Mizoram.

You will thus find that relief and rainfall play an important part in determining the distribution of population in our country. The population is concentrated in the flat alluvial lowlands with a fairly heavy and assured rainfall. The high hills with extremely uneven terrain and too heavy a rainfall are among the most sparsely peopled parts of our country. Then the arid lands of Kutch and Rajasthan



The territorial waters of India extend into the sea to a distance of twelve nautical miles measured from the appropriate base line.

FIG. 36. *India—Population Density*

Note the most thickly populated parts of India. What relation do you find between population on one hand and relief and rainfall on the other?

are also very thinly populated.

In between these two extremes are the plateaus which are not so fertile and the rainfall which they receive is also inadequate and uncertain. In recent years the population in some of these regions has been increasing wherever irrigation facilities have been provided on a large scale. Punjab and parts of northwest Rajasthan are examples of this type.

Look at the population map. You will note that very large areas along our frontiers are very thinly populated. Areas in Kutch and Rajasthan which are close to our frontier with Pakistan are very sparsely populated. The same is true of the areas in Jammu and Kashmir, Himachal Pradesh, Kumaun Hills in Uttar Pradesh and Arunachal along our frontiers with Tibet now in China. Even the areas of Nagaland, Manipur and Mizo Hills forming a common frontier with Burma are very sparsely populated.

In all the three cases, the reasons for this very sparse population are quite different. In the first case it is mainly because of the deserts. In the second case it is due to a mountainous region. In the third case it is owing to thick rain forests. As against this our areas bordering Bangla Desh and Nepal are by and large thickly populated. Why is it so?

The density of population is the highest in Kerala where there are about 550 people per square kilometre. Then comes West Bengal with an average density of a little over 5oo persons per square kilometre. The average density of population decreases gradually from east to west as we move inland into the Ganga Basin. The average density of population of Uttar Pradesh is in fact slightly less than that of Tamil Nadu. The most thinly populated states are Nagaland, Jammu and Kashmir, Rajasthan and Assam.

Population in India is mostly rural. In 1901 there were 88

per cent of the people living in rural areas. This percentage has come down to 80 by 1961. It means more and more people are coming to towns and cities in search of jobs. They do so because they do not find any more jobs in rural areas where agriculture is the only major economic activity.

This migration of people from villages to large towns and cities at a rapid rate results in overcrowding. This leads to the development of slums where living conditions are found most unhygienic.

In India there are nine cities having a population of over a million people. They are Calcutta, Bombay, Delhi, Madras, Hyderabad, Bangalore, Ahmedabad, Kanpur and Poona. Over a hundred cities have a population between 100,000 and 1,000,000 people.

How Fast Our Population Has Been Growing

Today the population of India is over 547 million people. However, in the year 1921, that is 50 years ago, the total population of India was just 251 million people. It means then there were only 80 persons per square kilometre as against 182 today.

Do you know the number of people that we add to our total population every year is equal to that of the total population of the whole of the Australian continent?

In a ten-year period between 1921 and 1931 the population rose by 11 per cent. But during the decade 1961 and 1971 it had increased by as much as 24.6 per cent. It shows that the rate of population growth has more than doubled during this period of 40 years. It is indeed an alarming situation. What is meant by the rate of population growth? How is it found out?

Once in every ten years the Government of India undertakes a big operation to enumerate the total number of people in every nook and corner of the country. At this time a good deal of information

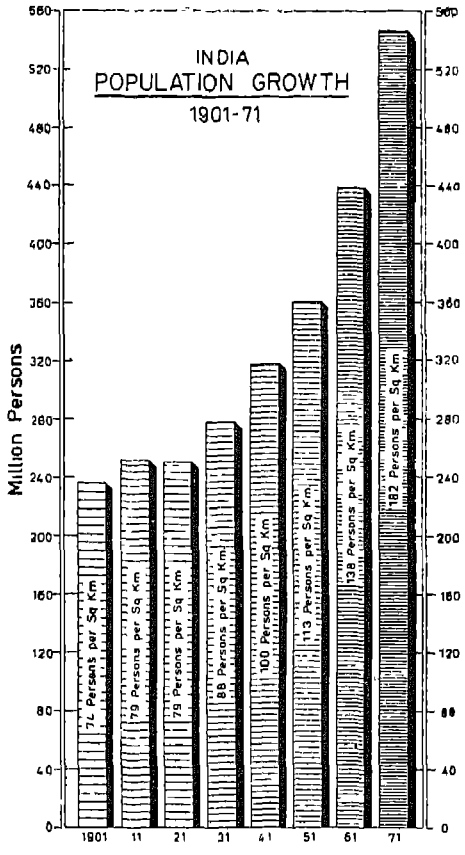


FIG. 37. *Growth of Population*
Note that the population increased very slowly till 1921 Thereafter, however, it has been increasing at a much faster rate. How will you explain this?

is collected about all the people in the country. It relates to their social and economic conditions as well. This operation is known as *census* and is carried out in the first year of every decade. The science dealing with various aspects of population and its growth is called *demography*. The demographers collect a lot of statistics about our population. They study them carefully and draw useful conclusions for us.

In every village and town of our country a register is maintained

in which every birth and death is recorded. Every head of the family is required under the law of our country to report these facts. After studying these figures the total cases of deaths are counted. Then they are worked out for every thousand of our population. In the decade 1911 to 1921 it was found that there were 47 deaths per thousand of our population. This death rate was as low as 23 during the decade 1951-1961. What does it mean? It shows that there were too many deaths 50 years ago. Thank God! Now death visits our families less frequently. What is it due to?

This has been due to the success we have achieved in controlling or eradicating certain diseases like malaria and epidemics like plague and cholera. New and effective medicines and the increasing medical facilities for our people have also been responsible for the same. Death which was a more frequent visitor has been held at bay to a considerable extent. The most important piece of evidence to this effect lies in the fact that now on an average a child born in the seventies can expect a much longer life than what it could have been 50 years ago.

This life expectancy has also gradually increased from a mere 20 years during 1920 to a little more than 50 years in the year 1970. The life expectancy in some of the advanced countries of the world is between 65 and 70 years. With the present trend in our country it should not be difficult for us to further reduce our death rate. Also we may increase our life expectancy through our planned efforts by every family, local community, social organizations and government agencies.

The demographers have also calculated the birth rate. In the first decade of the twentieth century the birth rate in India was 49 per thousand of our population. At the middle of the current century it had been slightly reduced to 42 persons per thousand population. It is the gap between the death or *mortality rate* and the *birth rate* which determines the *growth rate of population* in any country. The actual

rate of population growth in India was only one per thousand population during 1911-1921. This had shot up to 19 per thousand of our population by the end of 1961. Is it not a very alarming trend ?

This has upset the entire balance between births and deaths. The sudden rise in the growth rate of population is due to a simple fact that we have been successful in bringing down the death rate through our planned efforts.

In fact we are, as we should, going to lower down the death rate further like the other advanced countries of the world. In Ceylon and Japan the death rate is as low as 12 and 8 respectively per thousand of population.

Now if we have to establish a balance between the birth rate and death rate, all that we shall have to do is to bring down the birth rate as well. This is now completely possible; and will have to be done through our equally planned efforts; and not by leaving things to chance. This alone would help in stabilizing our population which has been growing at a rapid pace. If the present trend continues, the population of our country will be doubled in a period of just 35 years! It has been calculated with a degree of certainty that our population will cross the one thousand million mark by the turn of this century.

What would our country be like with 1,000 million people by the year 2,000 A.D. ? The density of population in our country would be then more than 340 persons per square kilometre. Remember that all these people would have to be properly fed. Even as it is we are unable to provide adequate and nutritious food to our existing population. Then they would require clothes, houses, schools, dispensaries and hospitals, and above all enough jobs to earn a respectable living.

Growing Population and Diminishing Resources

In the year 1951, on an average, every individual in India could claim slightly more than half a hectare of cultivable land. By the

year 1965, this per head or *per capita* share had shrunk to just two-fifths hectare of cultivable land. What does it mean? This means if we have to produce sufficient and nutritious food for all of our people, we have to increase the agricultural yields considerably and more so continuously.

Since there is no more cultivable land lying idle, all that we have to do is to raise our agricultural yields as long as our population continues to rise. How long and to what extent shall we be able to do it? By the turn of the current century an individual on an average would have to be content with only one-fifth hectare of land. This too will be possible provided we succeed in protecting all the cultivated land from being encroached upon for purposes other than agricultural. Then there are several other resources like mineral ores or coal which once consumed are consumed for ever.

We must also remember that we want every human being in our country to lead a decent life. He should be able to meet all his needs and comforts making his life worth living. We would certainly like that his living conditions compare favourably with those found in the rest of the world.

Improving the Quality of Our Living

A certain minimum number of people is a must for any country to fully utilise its resources. However, beyond a certain limit a mere number of people by itself does not become an asset. We in India have now reached a stage where we must think in terms of improving the quality instead of mere quantity of people. Every grown up person should be capable of putting in hard and productive work to increase our national wealth. We are now keen to see that all our population is strong and stout enjoying good health. This is possible when we meet our basic needs of food, clothing and shelter adequately. The diet we are able to have is balanced and nutritious. We provide enough

medical facilities to each one of us. Every one of us should be literate and well-trained. Such healthy, well-cared for, skilled and hard working people help to increase our national wealth. This is a must for improving the quality of living of our people. Our government has been actively engaged in this programme of developing our human resources.

Such people when they are properly equipped with modern machines and tools can produce more. Increased production leads to increase in our national wealth. In order to provide jobs for these people and increase our production we have to set up new mills and factories. We have to adopt new means of production in our farms and fields. We have also to provide essential social services to all our people. This calls for raising huge funds out of our savings which are very meagre at present.

You must have seen that generally children belonging to small families are relatively in a better position to get the necessary schooling and medical facilities. These smaller families are also in a position to save more, which in turn can be invested for increasing our national wealth. Thus our efforts to raise the standard of our people would very much depend on our success to put in hard labour and also to restrict the size of our families and thereby check the rapid growth of our population. Will it be too early to make up our minds right now?

THE NEW TERMS YOU HAVE LEARNT: *Census*—Official enumeration of population along with certain economic and social statistics in a given territory. *Growth Rate of Population*—Gap between birth rate and mortality rate per thousand population of a given region.

EXERCISES

Review Questions

1. Answer the following questions:
   (i) Which country in the world has the largest population?
   (ii) How densely is India populated as compared to the rest of the world?
   (iii) What is the average density of population in India?
2. Distinguish between:
   (a) Total population and average density of population.
   (b) Growth rate and birth rate of population
3. Make out correct pairs from the two columns:

(i) State with the highest population	
(ii) State having the highest average density of population	(a) Delhi
	(b) Uttar Pradesh
(iii) State having the lowest density of population	(c) Nagaland
(iv) Union Territory with the highest proportion of urban population	(d) Kerala
	(e) West Bengal

4. Complete the following statement with the correct ending:
   (a) Population in India has been growing very fast because
      (i) We need more and more people in view of the shortage of labour
      (ii) We have been setting up new big cities like Chandigarh and Bhubaneshwar.
      (iii) The death rate in our country has been dropping down.
      (iv) The birth rate in India has been constantly increasing.
   (b) We can stabilize our population by
      (i) Reversing the present trend in the death rate of population
      (ii) Bringing down the birth rate of population through planned efforts.
      (iii) Encouraging migration of people to the neighbouring countries
      (iv) Setting up new cities and townships.
5. Discuss the distribution of population in India with special reference to the areas of very high and low density of population.
6. What are the factors responsible for the rapid growth of population in our country? Why do we need to stabilize our population?

Map Work

7. Prepare a suitable graph to show the growth of population of Delhi since the beginning of this century.

1901	405,819
1911	413,891
1921	488,432
1931	636,246
1941	917,246
1951	1,744,072
1961	2,658,612
1971	3,629,824

Write suitable comments on this graph.

Topic for Class Discussion

8. *What is more Important—the Quality or the Quantity of Population?*

Let the class discuss this topic and decide why it is necessary to improve the quality or standard of living in our country. What steps are necessary to realise this objective?